VOL. V, No. 8 AUGUST, 1950

AGRICULTURAL CHEMICALS

In This Issue:

Cereal Seed Treatment • Fertilizer use of Molybdenum • Toxicity of Certain New Insecticides to Plants • Fertilizer Conference in Washington State • Nat'l Agricultural Chemicals Ass'n to Meet • NFA Pasture Tour • Progress Report on Allethrin • Nat'l Weed Control Conf. Formed • Fungicide Progress Report

facts

about POWCO BRAND LINDANE

POWCO BRAND LINDANE *is considerably more toxic than DDT against house flies.*

POWCO BRAND LINDANE *for fly control has a residual effectiveness lasting from three to six weeks, according to U.S.D.A. reports.*

POWCO BRAND LINDANE *meets approval of U.S.D.A. for use in dairy farms and on dairy animals—and in household sprays.*

POWCO BRAND LINDANE *is available in three forms: 10% Emulsion Concentrate, 10% Oil Soluble Concentrate, 25% Wettable Powder*

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PYRETHRUM POWDERS AND EXTRACTS
PYRINS
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BHC POWDERS AND LIQUIDS
COTTON DUST CONCENTRATES
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Manufacturers of Organic Chemicals

AGRICULTURAL CHEMICALS

THIS MONTH'S COVER

New dragline at work at Virginia-Carolina Chemical Corporation's phosphate mines at Nichols, Fla. The huge machine weighs 1,600,000 pounds; moves some 25 tons of rock in less than a minute, and will be responsible for furnishing V-C, the phosphate rock which goes into its fertilizer manufacturing activities.

AUGUST 1950
VOL. V No. 8

A Monthly Magazine For the Trade

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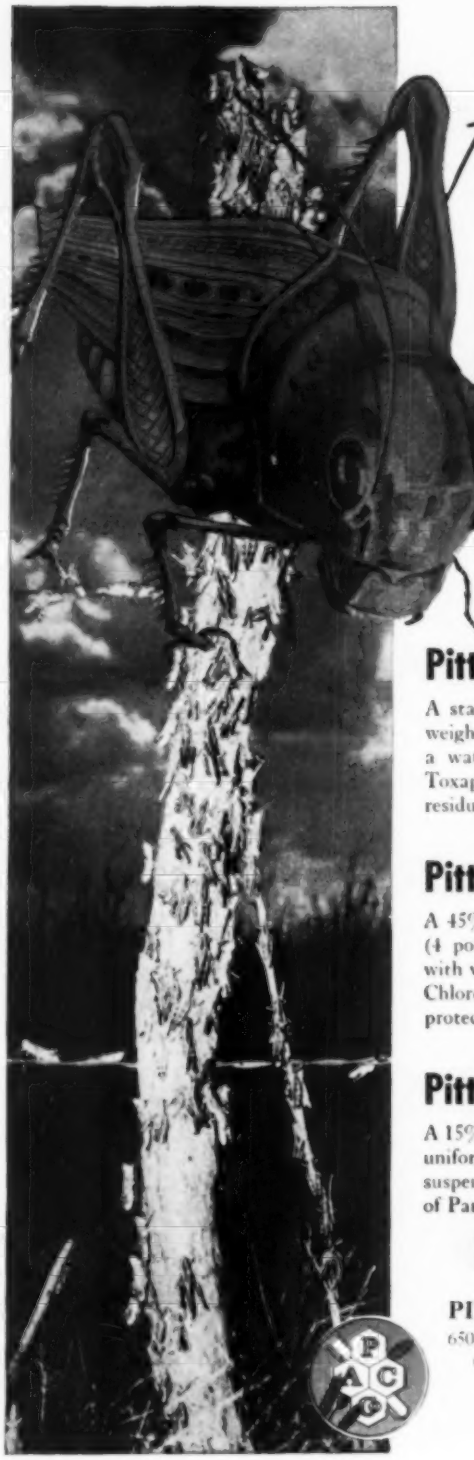

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A standardized liquid emulsifiable concentrate containing 60% by weight (6 lbs. per gallon) Toxaphene, specifically designed for use where a water spray application is adaptable and practical. *Pittsburgh* Toxaphene-60 spray concentrate possesses the advantages of marked residual action and is effective on a wide range of insects.

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Send your product to market in a "KRAFT BAG"—the container for a thousand uses!

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Adaptability **—virtually unlimited!**

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Because of its unique design and the uncompromising quality that goes into every step of its construction, the Beckman Model G pH Meter is—by every standard—the unquestioned choice wherever utmost accuracy, versatility and laboratory convenience are desired.

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The unique electronic circuit used in the Model G permits pH to be read directly from a large accurately-scaled potentiometer dial. Accuracy of the Model G is entirely independent of mechanical variations in a registering meter or of changes in the characteristics of the amplifier—a very important advantage in precise laboratory investigations.

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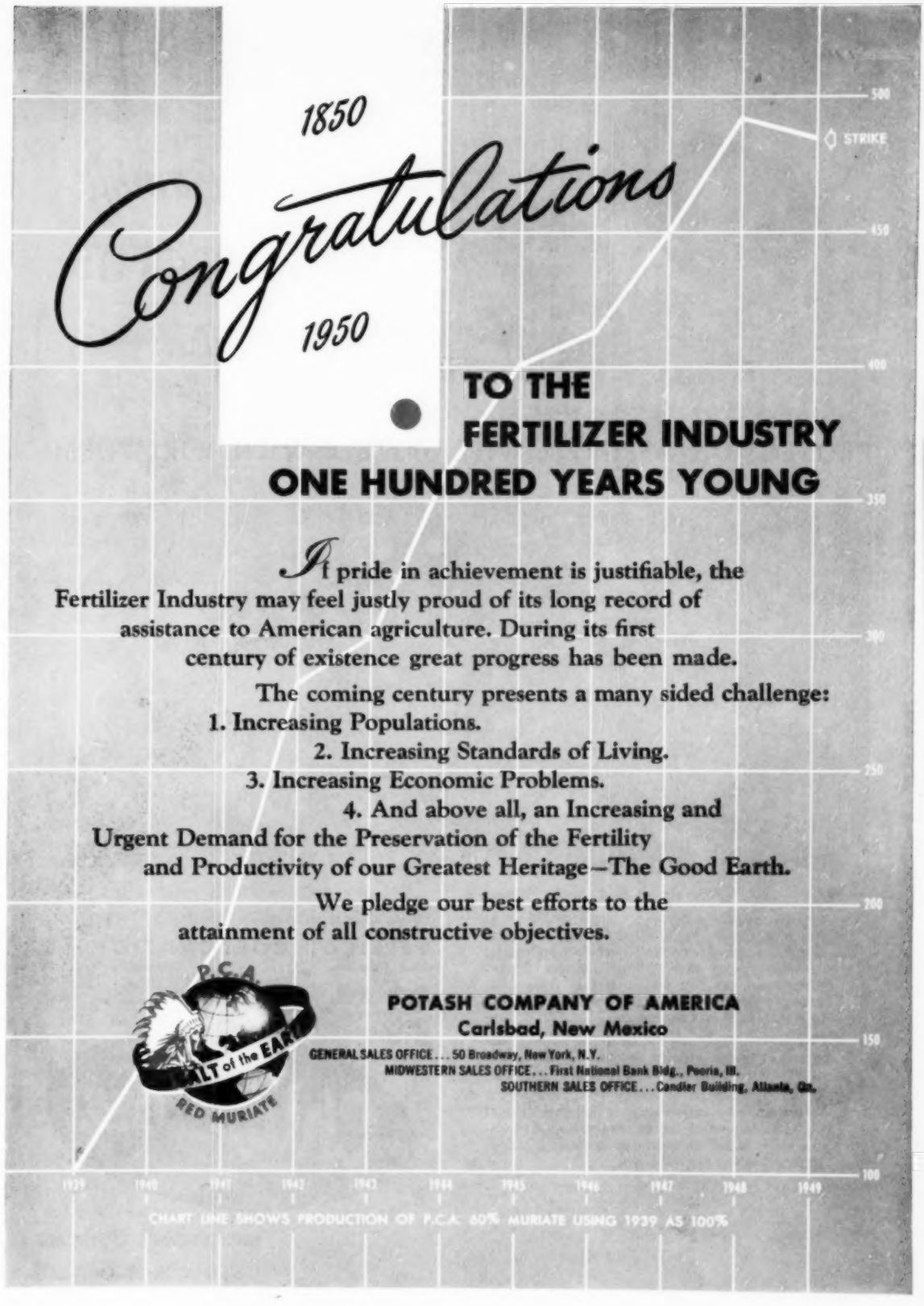

1850

Congratulations

1950

TO THE FERTILIZER INDUSTRY ONE HUNDRED YEARS YOUNG

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1. Increasing Populations.
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3. Increasing Economic Problems.
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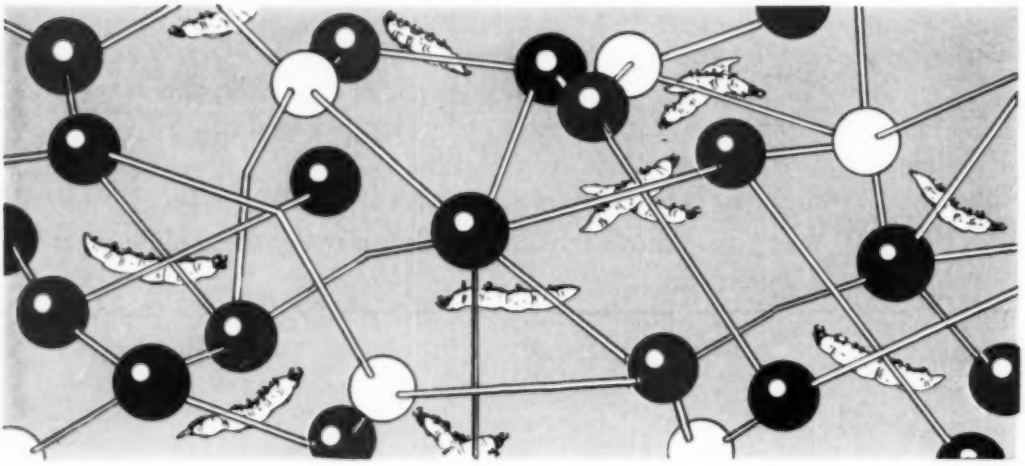
PROTECTION ASSURED, WHY GAMBLE WITH WIREWORM



Reports indicate a heavy concentration of wireworms this year. Experienced formulators know that they must service their customers before the wireworms start their annual damage. Proper attention at this time means freedom from wireworm devastation and brings a good profit margin to both farmer and formulator.

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So prepare now and remember that the Velsicol Corp. backs up their manufacturers and formulators with technical assistance regarding proper applications and formulations.

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When crops are protected in the field, only half the job is done. It's just as important for the farmer to protect his crops in storage as it is to protect them in the field.

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Company .....

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CHEMICAL DIVISION
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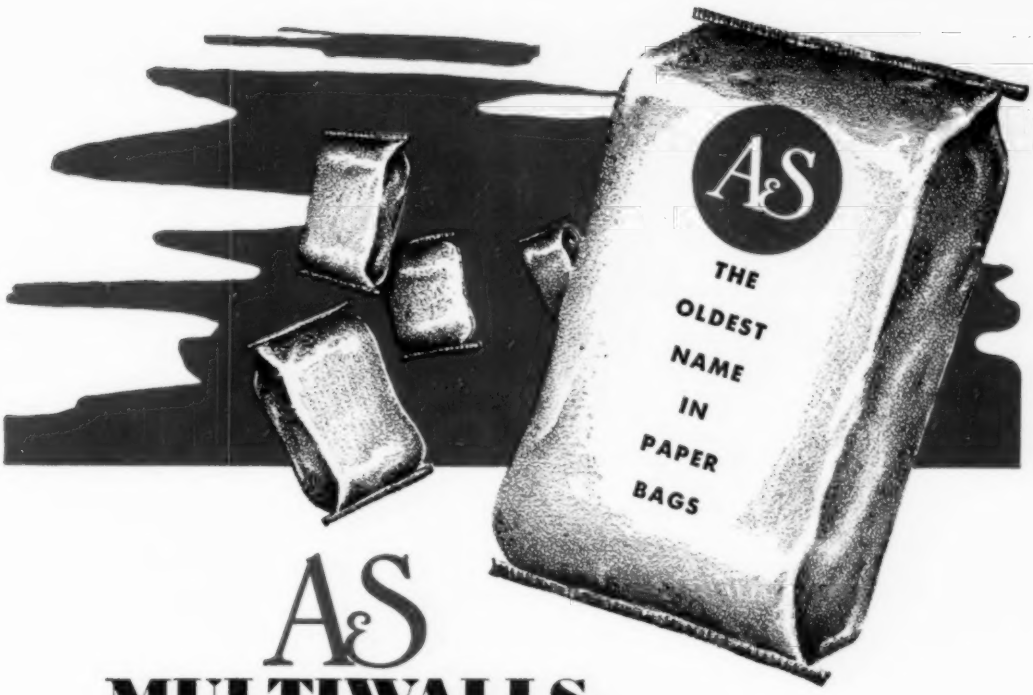
Technical advice and assistance to fertilizer manufacturers in solving their manufacturing problems is available for the asking. Just write.



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  Palletized shipments of A&S bags lower your handling costs, minimize storage space.
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  Strong, deep colors for sugar, salt, rice and similar bags.
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A&S Multiwalls *stand out* because they are printed on modern 4-color presses that reproduce a bag design in eye-arresting colors unsurpassed in commercial bag printing. Why not have our A&S packaging specialists analyze your packages? These men know how to build impact into the flat exterior of what could otherwise be a dull and unimaginative package. This combination of unusual design and faultless printing is yours at no extra cost.

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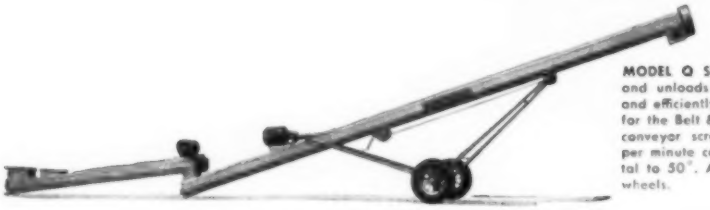
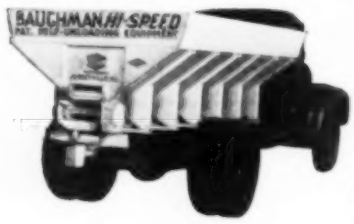


MODEL Q SCREW CONVEYOR loads and unloads cars and trucks quickly and efficiently — the perfect teammate for the Belt & Bucket Elevator! Big 9" conveyor screw gives up to 40 bu. per minute capacity from the horizontal to 50°. Available with or without wheels.



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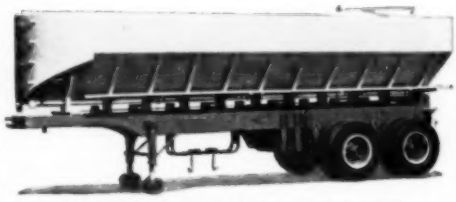
Available with sprayer attachment to prevent wind loss and hold the spread to the ground . . . also specialized rock phosphate spreading attachment.



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"The Pioneers of the Lime Spreading Industry"

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Ever see a steer get all hot and bothered because of flies and other annoying insects? If you did—and it happened within your market area—you're probably missing out on extra profits!

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Just think! In the above-mentioned tests, 8000 cattle were treated on pasture in 16 counties. Insect pests rapidly were brought under control, and the steers gained an average of 50 pounds a head more than untreated steers over the test period.

Cattlemen were quick to figure that a few cents worth of insecticide on a steer produced real profit for them. And you can quickly see how that can bring extra sales, extra profits to *you*. In fact, there are profits to be made all along the line—the *complete* line—of PENCO agricultural chemicals.

Remember, you can depend on PENCO products, because they come to you from a *basic* producer—made just right for their specific jobs. What's more, PENCO products are constantly being improved . . . to keep pace with the ever-changing needs of you and your customers.

For further information write to: Agricultural Chemicals Department, Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.; Tacoma, Washington; Bryan, Texas; Portland, Oregon; Los Angeles, Calif.

For livestock pest control dependable PENCO insecticides

Quick-Acting **PENCO® BHC W-12**
For control of cattle lice and ticks, cattle and hog mange, and many flies. Gives quick "knockdown," good residual effect. Wettable powder, contains 12% gamma isomer.

Long-Lasting **PENCO® CATTLE SPRAY**
For control of horn flies, mosquitoes, cattle, sheep and goat lice. Wets hair, penetrates coat, builds residual deposit. Wettable powder, contains 50% DDT. Mixes easily, remains in suspension, has superior dispersing and wetting agents.

Extra-Safe **PENCO HI-GAM® W-25**
For control of flies, cattle and hog mange, cattle lice and ticks. Made from lindane, approved by U.S.D.A. for use in residual fly control in dairy barns.

PENN SALT

agricultural chemicals

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RICELAND RICE HULLS

are the perfect conditioner for

Chemical Fertilizers

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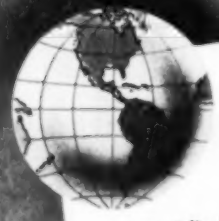
- ✔ Available in fine ground No. 16, medium ground No. 14 and coarse ground No. 12.
- ✔ Used and preferred by leading fertilizer manufacturers.
- ✔ Available in large volume the year 'round.
- ✔ Shipped in bulk or 100-pound burlap bags (25 to 40 tons per car).
- ✔ Very inexpensive.
- ✔ Wire, phone or write for free sample and price.



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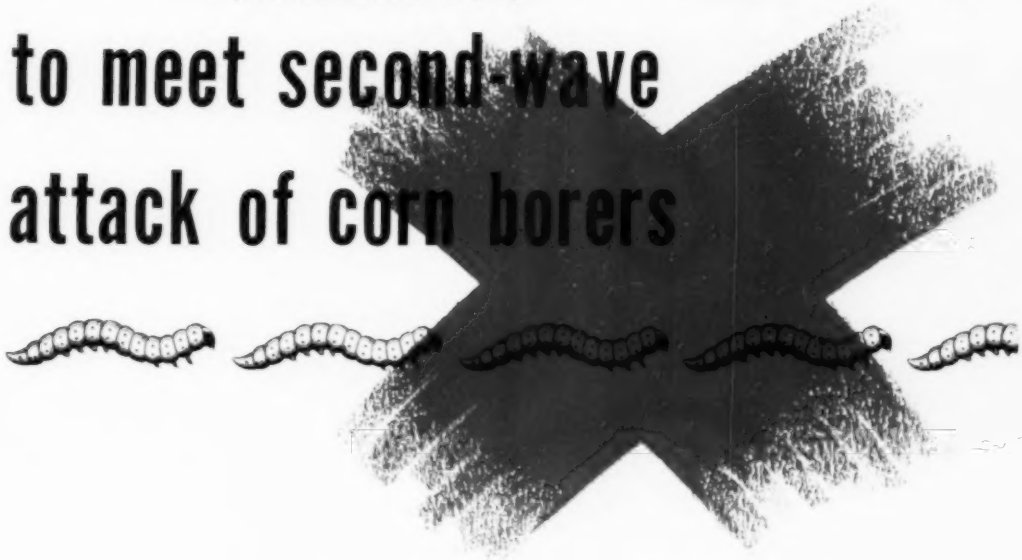
World's largest rice growing, milling, storage and marketing organization.

World's largest year 'round supplier of rice hulls to fertilizer manufacturers.

have SANTOBANE ready
(MONSANTO DDT)

to meet second-wave attack of corn borers



Last year, the corn belt was plagued with two attacks of corn borer . . . the first generation in June; the second brood in August. The same scourge may hit the corn-fields this year.

Farmers lost as much as $750 per farm on corn-borer damage last year.

Santobane, Monsanto's DDT, is an effective weapon in the battle against borers. Properly formulated, Santobane has broad insecticidal qualities, acting both as contact poison and stomach poison. It is an effective insecticide for use in dusts, emulsions, suspensions and solutions.

For further information, mail the coupon or contact the nearest Monsanto Sales Office. MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1766-G South Second Street, St. Louis 4, Missouri.

MAIL COUPON FOR DATA on Monsanto Emulsifiers and Wetting Agents. Ask for *new* Technical Bulletin No. P-142.

MONSANTO INSECTICIDAL CHEMICALS

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SANTOCHLOR* (para-Dichlorobenzene)
SANTOPHEN* 20 (Pentachlorophenol, Tech.)
TRICHLOROBENZENE, Technical
NIFOS*-T (Tetraethyl Pyrophosphate, Tech. For agricultural use only)
NIRAN* (Parathion. For agricultural use only)

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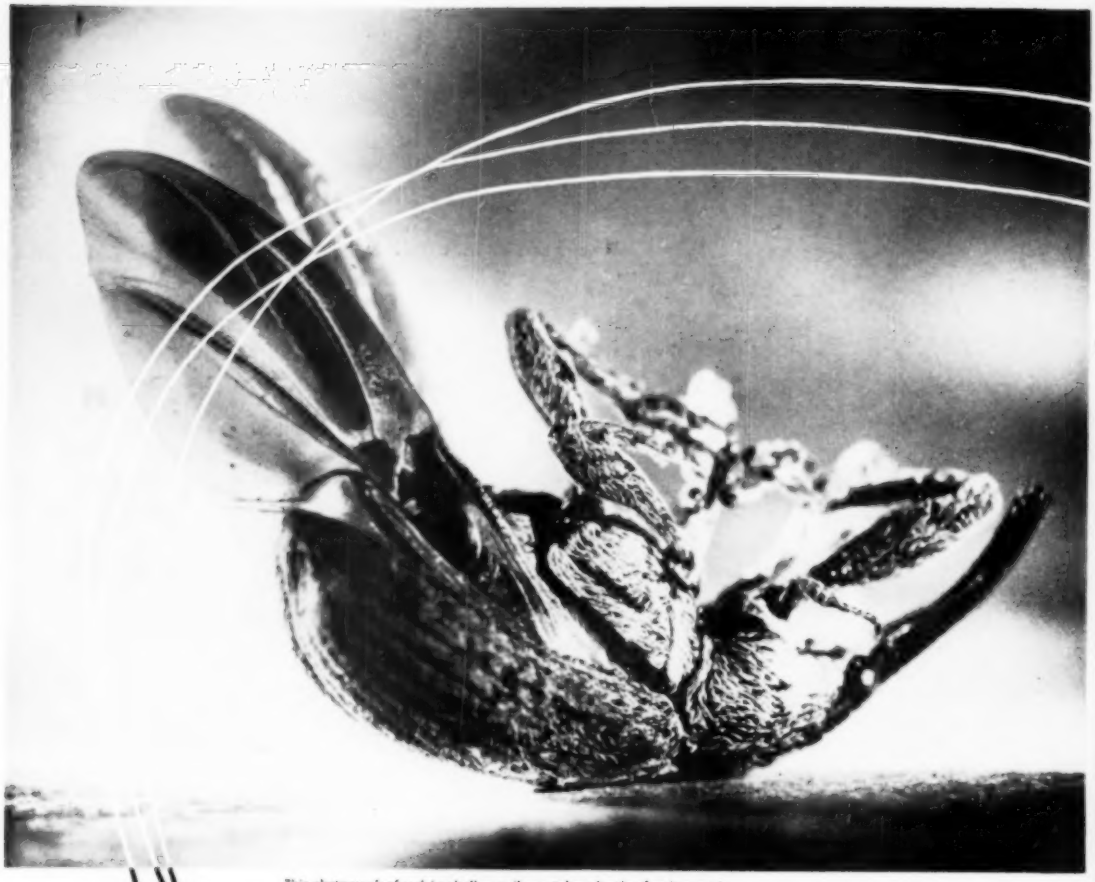

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THE EDITOR COMMENTS

NOT that anyone objects to a Congressional Committee's finding out all it can about any alleged harmful effects on the nation's health and security from the use of chemicals in agriculture, but there is considerable comment in the industry just now about the recent passing of the Sabath Resolution (HR 323) which authorizes a seven-man congressional committee to make such an investigation. The objections being voiced sound quite logical to us in asking why it is necessary for the House to make such a move at a time when the best qualified minds of the U.S.D.A., the Food and Drug Administration and the entire commercial pesticide industry are already working together to assemble data on the same subject, and for the same purpose.

A tremendous amount of duplication and confusion would certainly be avoided if Congress would just wait for the FDA Hearing to end, and for the tolerances for various pesticides to be set. If questions then still remain unanswered and Representative Sabath desires more information, let him call for an investigation on any questionable findings and try to clarify them. As it is, we can see a rehashing of the same material before the seven-man group, with very little, if any, additional information coming forth. With all respect to the Congressmen who will take part, the solution of problems as technical and complex as those arising from discussions of entomology, toxicology, residue tolerances and plant physiology demand the attention of persons expert in such matters.

Without the presence of such scientific brains, and despite the best intentions in the world, irresponsible "scare" stories are bound to appear in the press. Isolated cases of "poisoning" will be played up completely out of proportion to their importance and out of context, and the public will be more confused than ever, if that is possible.

As it is, there seems to be little for the industry to do, other than to sit by with fingers crossed. The National Agricultural Chemicals Association has offered its cooperation to the investigating committee, although, as we say, the industry might be pardoned for feeling that such an investigation is not only unnecessary at this time but could bring serious and widespread confusion.

PROBABLY the single toughest problem in any and all parts of the chemical industry today is the shortage of chlorine. Other items are scarce and difficult to obtain, but the chlorine situation is acute. Two of the largest producers have been out on strike in the face of probably the largest demand in history. The effects of this chlorine shortage are being felt everywere, not excepting the field of agricultural chemicals. DDT is extremely scarce, some manufacturers indicating that they are sold up through the balance of the year. Production which rose close to seven million pounds per month in May has been cut by inability to obtain chlorine. The same applies to 2,4-D, BHC, toxaphene, the chlorobenzenes, carbon tetrachloride, carbon bisulfide, and so on.

In the midst of extremely heavy demand for finished insecticides, fungicides and weed killers, many manufacturers find their hands tied. They are simply unable to deliver in the quantities required promptly for current seasonal use. In addition, they are worrying already about 1951 raw material supplies in a situation complicated by scare buying of all chemical products. Today is not too early under present conditions to think about materials for early 1951 delivery. Those who covered early this year can thank their lucky stars!

With the widening use of chlorinated products in agriculture the long-range outlook in chlorine products has a bearing on the business of every manufacturer in the field right down to the smallest insecticide mixer.

With strikes settled and present facilities operated at capacity, the output of chlorine is something over 2 million tons per year. At least 10% more than this will be needed in 1951 and 1952—so, don't be caught short on any chlorinated material if you can help it!

B.E.P.Q. Assistant Chief Reports on Preliminary Results with

ALLETHRIN

IN March 1949 the Bureau of Entomology and Plant Quarantine announced that their chemists Schechter, Green, and LaForge (1 & 2) had discovered a method of synthesizing esters closely related to natural cinerin I, culminating 15 years of intensive research on the chemistry of pyrethrum by Dr. LaForge and his associates.

Initial biological tests by the turntable method by Gersdorff and associates on one of the esters, a *dl*-2-allyl-4-hydroxy-3-methyl-2-cyclopenten-1-one esterified with trans-*d*-chrysanthemum monocarboxylic acid, indicated a striking knock-down effect on house flies and a kill about six times that of natural pyrethrins. It should be emphasized, however, that the acid portion of this particular ester was not synthetic but came from the natural source. These biological results excited considerable interest in the technical synthesis of insecticides of the pyrethrin type.

Representatives of many chemical and insecticide companies visited the Bureau research workers at Beltsville, Md. to familiarize themselves with the chemical precedures in producing the completely synthetic ester and its uses. People connected with the prethrum industry in Kenya and the Belgium Congo were naturally much concerned by the announcement. This concern was also felt in Japan, for the U. S. military Government is giving consideration to the rehabilitation of the pyrethrum industry in that country. Circulation of information relative to probable toxic hazards in connection with the use of the new chlorinated hydrocarbon and organic phosphorus insecticides also intensified the interest in the synthetic producton of an insect killer which appeared not to present toxic hazards.

The *dl*-2-allyl-4-hydroxy-3-methyl-2-cyclopenten-1-one esterified with cis and trans *dl*-chrysanthemum monocarboxylic acids was shown to be the most practical ester from the standpoint of economical preparation and insecticidal action, and was the one selected for technical production. This completely synthetic ester has been designated as the allyl homolog of cinerin I[2]. Small amounts for biological testing were made available by the Division of Insecticide Investigation to some of the other Bureau laboratories and to a number of workers including those in industry. Some of the insecticide manufacturers also began turning out experimental lots, and they are being tested by a number of institutions, often in comparison with Bureau material.

Little information on the insecticidal efficacy or toxicology of the allyl homolog of cinerin I has been published thus far but with the intense interest in this synthetic material and related compounds and the availability of them in larger quantities there will no doubt be many scientific contributions made in the next year.

Flies and Mosquitoes

GERSDORFF (3), in initial tests on house flies by the turntable method, found the ester with the natural dextro acid component to be about six times as toxic as the natural pyrethrins. He (4) also reported the completely synthetic ester, with the mixed acid components, to be about three times as toxic as the natural pyrethrins, also that the ester with the natural acid was as toxic after a year's storage as when fresh and that distillation in high vacuum did not affect thetoxicity of either ester to house flies.

Stoddard and Dove (5) showed that in turntable and Peet-Grady tests on house flies the allyl homolog of cinerin I was less effective than the natural pyrethrins at low concentrations but more effective at high concentrations.

In order to present some of the trends, with reference to the use of the completely synthesized allyl homolog of cinerin I, I have assembled some of the preliminary results of tests carried out by various members of the Bureau of Entomology and Plant Quarantine. It must be recognized that these are very preliminary results and the data are therefore only indicative.

Tests made subsequently to those reported by Gersdorff, in which the synthetic material was compared with natural pyrethrins applied as space sprays against house flies, indicated that the materials were essentially of the same order of toxicity. A rather large series of tests carried out by W. V. King and associates showed natural pyrethrins to be slightly more effective when applied at 0.1%, but the reverse was true when used at 0.2%. This result bears out the findings of Stoddard and Dove.

The effect on knock-down and kill of house flies when syner-

1. Paper presented at American Association of Economic Entomologists meeting, Tampa, Fla., December, 1949.
2. Since paper was presented, the coined name, "allethrin" has been adopted for the ester.

by

Dr. F. C. Bishopp

Assistant Chief, Bureau of Entomology and Plant Quarantine,
U. S. Department of Agriculture,
Washington 25, D. C.

gists were added has proved most interesting. The increase in toxicity of synthetic material through the addition of piperonyl butoxide was not so marked as in the case of the natural pyrethrins. King, for instance, reports a 34% increase when piperonyl butoxide was added to the synthetic in the proportion of 5 to 1, as compared with 54% increase when the natural material was used.

E. W. Laake and associates also found this to be true when house flies were exposed to the surfaces of cages that had been dipped in acetone solutions containing 0.1% of the various materials. Cages tested after 24 hours indicated a mortality of 75% for the synthetic ester against 47% for the natural pyrethrins, but 1% of piperonyl butoxide added to the natural pyrethrins increased the toxicity to 92% but did not enhance the effectiveness of the synthetic ester.

A number of comparative tests with the yellow-fever mosquito have been run at the Orlando laboratory. Tests with 0.1 and 0.2% solutions of each material, alone and with 2% of piperonyl butoxide, applied as space sprays indicate the synthetic material to be slightly less effective than the pyrethrins. The addition of piperonyl butoxide materially stepped up the action of the synthetic ester but did not enhance that of the pyrethrins.

The Orlando laboratory also tested 23 pyrethrin-likes esters against house flies and mosquitoes. The most toxic compounds were dl-2-allyl-4 - hydroxy-3-methyl-2-cyclopenten-1-one esterified with trans-d-chrysanthemum monocarboxylic acid and dl-4-hydroxy-3-methyl-2 (2-methallyl)-2-cyclopenten-1-one esterified with trans-d- chrysanthemum monocarboxylic acid.

TESTS of the residual effectiveness of natural pyrethrins as compared with the allyl homolog of cinerin I were conducted by E. W. Laake and associates on the stable fly. These materials were used at 0.1% concentration, alone and in combination with 1% of piperonyl butoxide, as dips on screen-wire cages, and stable flies were introduced 1 day later and exposed for 24 hours. The natural pyrethrins, alone and in combination, gave a 100% knock-down and kill, whereas the synthetic ester alone gave 60% and 40%, and in combination with piperonyl butoxide 87% and 72%, respectively. In another test without the synergist the natural pyrethrins gave a 100% knock-down and kill as compared with 92% knock-down and 85% kill for the synthetic ester. The natural material with piperonyl butoxide gave 100% knock-down and kill, as compared with a 82% knock-down and a 70% kill for the synthetic product. Additional tests with stable flies introduced 4 days after treatment indicated that the natural was much more effective than the synthetic material from a residual standpoint and that the synthetic ester was not stepped up by the addition of piperonyl butoxide.

Some preliminary tests with residual treatments on flood-water *Aedes* were secured by A. L. Lindquist and coworkers. The materials were applied at the rate of 0.5 mg. per square foot and 24 hours later mosquitoes were exposed for 2 minutes. The natural pyrethrins gave a mortality of 74%, a commercial synthetic product 58%, and synthetic material prepared by Bureau chemists 44%. When piperonyl butoxide was added to each product, all the mosquitoes exposed 2 hours in cages treated with natural pyrethrins were killed, exposure in cages treated with the commercial synthetic product killed 63%, and similar exposure to the Bureau material killed 45%.

There is special interest in determining whether the completely synthesized esters can be substituted for the natural pyrethrins in aerosols. J. H. Fales, R. H. Nelson, and R. A. Fulton, who have been giving much attention to that subject, reported on their tests at a recent meeting of the Chemical Specialities Maunfacturers Association. The synthetic material has little or no Freon-insoluble content and in preliminary tests appeared to be less irritating to the respiratory tract than the pyrethrins.

In tests on the house fly with aerosols and sprays in a Peet-Grady chamber these workers found that the knock-down and 24-hour kills with the synthetic ester and natural pyrethrins were essentially identical. Their tests showed a marked increase in effectiveness of the allyl homolog of cinerin I from the addition of 2% of different synergists—n-Propyl Isome, piperonyl butoxide, and sesame oil. In sprays the natural and synthetic products showed about equal performance against the common malaria mosquito.

Household Insects

AGAINST American cockroach, Piquett (6), showed the natural material to be approximately four times as toxic as the synthetic when applied as a 0.6% dust to confined adult males. In other tests Piquett showed synergists to step up the kill materially - piperonyl butoxide 45% and n-Propyl Isome 52%.

Fales and coworkers, in tests on the American cockroach with aerosols in a Peet-Grady Chamber, found the natural pyrethrins to be outstandingly better than the synthetic material.

A rough determination of the LD-90 for female nymphs of the American cockroach by the injection method was made by F. H. Babers and J. J. Pratt. For natural pyrethrins it was 1.375 gamma per gram and for the synthetic 3.25 gamma per gram. This indicates the natural material to be about 2.4 times as toxic as the synthetic to the American cockroach by this method.

W. G. Bruce and H. Laudani ran some tests on the effectiveness of natural pyrethrins and the synthetic material against the little black ant by exposing these ants for 30 minutes on pads treated with the insecticides. When these pads were aged 8 days after treatment the kill of natural pyrethrins was 12% as compared with 31% for the synthetic ester and the addition of piperonyl butoxide or n-Propyl Isome did not materially improve the effectiveness of either product. When the pads were aged only 1 day, the mortality at the 48-hour reading was increased to some extent by the addition of these synergists.

Bruce and associates also conducted some tests with the black carpet beetle by impregnating cloth with acetone solutions of these materials and exposing the beetle larvae to it. At 5 mg. per square foot, the synthetic ester produced slightly less knock-down but higher mortality and a longer residual than the natural pyrethrins. At 15 mg. per square foot the synthetic product showed about the same knock-down, slightly lower mortality, but longer residual effectiveness than natural pyrethrins. The same two synergists increased the knock-down effect of the synthetic material but did not increase the mortality.

Preliminary comparisons of natural pyrethrins and synthetic material produced by an insecticide manufacturer in tests against the confused flour beetle have been carried out by N. M. Dennis and R. T. Cotton by their glass-plate method. A number of different synergists and various rates of application were compared. They found that the mortality of adults after 12 days was essentially the same for the natural product and the synthetic material without the synergist but one commercial synergist greatly increased the kill with the synthetic ester.

Table 1

Comparative Toxicity of the Allyl Homolog of Cinerin I and Natural Pyrethrins, Parathion, and Dreft to the Two-Spotted Spider Mite. All materials at 25% strength.

Insecticide	*Pounds/100 gallons*	*Percent dead and moribund*
Synthetic ester	0.5	56
	1	72
Natural pyrethrins	0.5	8
	1	89
Parathion	0.5	91
	1	100
Dreft	0.08	0.23

The commercial synthetic ester was somewhat more effective against the confused flour beetle than the Bureau-produced synthetic. The effect of the addition of different synergists to the synthetic material varied widely. This and other work indicates the need for further extensive experimentaton with synergists, and also shows that one should not place too much reliance on translating results with natural pyrethrins to the synthetic material.

Agricultural Insects

ENTOMOLOGISTS of the Bureau have made tests with the synthetic material on only a few species of agricultural insects. E. H. Siegler conducted laboratory tests with the green peach aphid, the bean aphid, the two-spotted spider mite, and the Mexican mealybug, using the leaf-disk technique. The synthetic material and natural pyrethrins, each at 25%, when applied at the rate of 0.25 pound per 100 gallons of water with 0.06 pound of "Dreft" added as a wetting agent, gave a 100% kill of bean aphids. Against the green peach aphid the synthetic material at the same strength gave a 100% kill, whereas the natural material killed 97%. The "Dreft" itself killed 2% of the bean aphids and 37% of the green peach aphids. The results with the two-spotted spider mite are given in Table 1. In a test on the Mexican mealybug various materials at 25% strength at 0.5 pound per 100 gallons of water plus 0.08 pound of "Dreft" gave the following kills: synthetic ester 84%, natural pyrethrins 92%, parathion 100%, "Dreft" alone 14%.

Floyd F. Smith conducted some preliminary tests with gas-propelled aerosols containing 1 percent of pyrethrins in Deobase and 1 percent of the allyl homolog of cinerin I against a number of green house pests. He concluded that the pyrethrins gave a slightly better kill than the synthetic material against the cotton aphid, the green chrysanthemum aphid, the Mexican mealybug, and the two-spotted mite.

Preliminary laboratory tests on the citrus blackfly made in Mexico City by A. C. Baker and associates indicate a slight superiority of the synthetic ester in Deobase over a similar solution of pyrethrins.

The results of laboratory tests by G. T. Bottger and A. P. Yerrington give a rough comparison of the toxicity of natural pyrethrins and

(*Turn to Page 76*)

Table 2

A General Comparison Between Allyl Homolog of Cinerin I and Natural Pyrethrins (0.60% Pyrethrin I and 0.63% Pyrethrin II) When Used in Dusts and Sprays

Test Insect	*Dusts*	*Sprays*
Alder flea beetle	More effective	More effective
Armyworm	More effective	No difference
Celery leaf tier	¼ as effective	10 times as effective
Large milkweed bug	½ as effective	Twice as effective
Pea aphid	½ as effective	Less effective
Two-spotted spider mite	1½ times as effective	About equal

Puyallup Host to 110 at Washington State's First

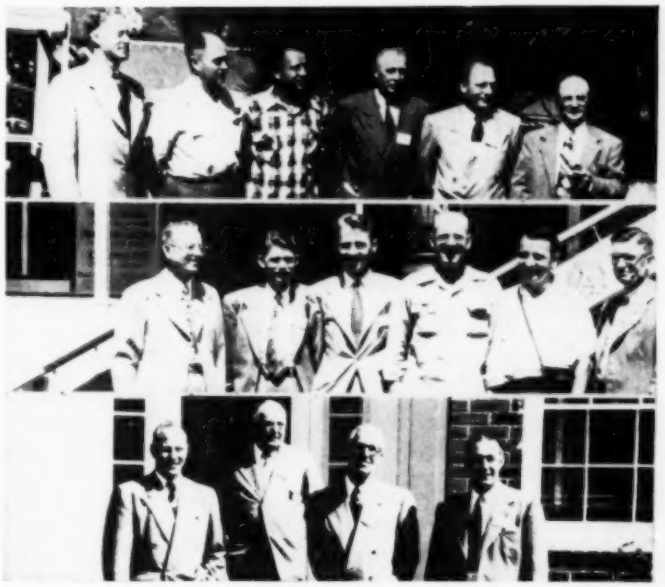
FERTILIZER CONFERENCE

IN a two-day conference, first of its kind in the area, 110 persons met at Washington State College's Western Experiment Station at Puyallup July 17 & 18 to discuss the use of fertilizers in maintaining soil fertility in the Pacific Northwest. The group voted unanimously to set up a Soil Improvement Committee of 11 members comprised of five industry representatives, five from soil research bodies (state colleges, experiment stations, U.S.D.A. scientists and others), and a chairman who will act as liaison between the two groups. The committee, whose members have not yet been announced, will function under the Pacific Northwest Fertilizer Council, formerly known as the "Washington-Oregon Fertilizer Council." The change in name became necessary with the addition of another state, Idaho.

Describing soil and fertilizer research being carried on in the area, soil scientists from colleges and experiment stations in the three states represented appeared on the program. Later, industry representatives took the stand and discussed the problems faced by industry, proposed solutions of these problems, and pointed out objectives of the fertilizer industry. The importance of cooperation was emphasized, in connection with the necessity of helping the farmer to meet his soil needs. Speakers reiterated that use of the right kind of fertilizer at the proper time is a complicated procedure, requiring lots of research, probing, asking questions and the cooperation of scientists, the manufacturing industry and the farmer.

Dr. Russell Coleman, president of the National Fertilizer Association, Washington, D. C. pointed out that although crops still grow bountifully in the Northwest, there should be serious thought about more scientific use of fertilizers. He told the group that the time to think about correcting a decrease of soil fertility is before the condition gets out of hand. "Think now, while you have your rich soils; if you don't preserve them, they will become depleted as others have been," he warned.

He said freight charges caused fertilizers in the Northwest to cost as much as 40 per cent more than elsewhere. "Your industry here has many problems," he continued, "but



—Photos by Robert Kull

Top photo, (left to right): Dr. B. R. Bertramson, chairman, Washington State College Agronomy Department, Pullman; H. P. Singleton, superintendent, WSC's Irrigation Experiment Station, Prosser; Karl Baur, soil scientist, WSC's Western Washington Experiment Station, Puyallup; Walter R. Johnson, assistant director of the Washington State Department of Agriculture; Mark T. Buchanan, director of WSC's Experiment Stations; and Dr. J. W. Kalkus, superintendent of the Puyallup station and vice director of the experiment stations.

Middle photo, (left to right): The men who described soil and fertilizer research in the area: Dr. R. E. Stephenson, soil scientist, Oregon State College, Corvallis; Nels Benson, soil scientist, WSC's Tree Fruit Experiment Station, Wenatchee, Wash.; Dr. H. M. Reisenauer, soil scientist, WSC; T. L. Jackson, agronomist at WSC; C. O. Stanberry, soil scientist, WSC's experiment station at Prosser, Wash.; and G. O. Baker, soil scientist, University of Idaho, Moscow.

Lower picture, (left to right): George Wickstrom, field representative of American Potash Institute, Sumner, Wash.; Mac C. Taylor, Oregon-Washington Fertilizer Company, Seattle; M. C. McCollam, Manager, Western States American Potash Institute, Inc., San Jose, Calif.; John B. Taylor, Jr., American Plant Food Council, Inc., Washington, D. C.

it can take advantage of past mistakes made in other areas where heavy quantities of fertilizers have long been used."

John R. Taylor, Jr., American Plant Food Council, Inc., Washington, D. C., said all groups have to cooperate to get information to the farmer—experiment stations, the Extension Service, Soil Conservation Service and other agencies, industry and vocational teachers.

"And you must do it as simply and concisely as possible," he added. "The farmer is too busy to be an expert on everything, and you've got to give him information short and sweet."

Dr. B. R. Bertramson, chairman of WCS's Agronomy department, said fertilizers will be necessary to maintain the "tremendous" yields of the Northwest. And fertilizer is cheap, he emphasized. "The farmer's dollar buys twice as much of it as it does other things he buys."

He said the average farmer today is a businessman, biologist, chemist and engineer all rolled into one. But principally he is a scientific farmer, "and he will have to continue to be to stay in business."

Dr. Bertramson declared also that the most important ways in which industry and research must cooperate are in getting available information to the farmer and gathering his problems for industry and research personnel to work on. "The only answer is by group action," he said. "And with this new committee, we're well on our way."

Dr. J. C. Knott, director of WSC's Institute of Agriculture Sciences, said the Northwest's wide diversity of crops and high yields were due to fertile soils and the right climate. "But yield per acre is not the only thing," he said. "A farmer has to grow economically, and that means scientifically, with good farm management." It's up to you people, both from industry and the research groups, to help him farm scientifically —to get the most out of his land for his money and effort," he concluded.

George Wickstrom, field representative of the American Potash Institute, Sumner, Wash., declared that "If we want really to find out what needs to be done in fertilizer research, we've got to get closer to the person for whom all this work is done—the farmer. Finding out his needs and his problems is the joint responsibility of industry and the colleges," he said. Commenting on the new soil improvement committee, he pointed out that "Before this committee was approved, we had nothing in the Northwest that represented all the members of the industry to coordinate its research or to recommend to the state colleges what was needed in fertilizer research," but now, he said, this new medium should prove very helpful.

Industry's big mistake is not cooperating more with the state colleges, according to M. E. McCollam, manager, Western States American Potash Institute, Inc., San Jose, Calif. "We often fail to appreciate fully the great influence that experiment stations, the Extension Service, and the agricultural colleges have on agricultural practice," he said.

Mr. McCollam said the Soil Improvement Committee of the California Fertilizer Association has cooperated with the colleges in several ways: through research and fellowship grants, joint meetings with experiment station staffs on fertility studies, meetings with extension service personnel to discuss local fertilizer problems and the best way to present information to the farmer.

Arthur King, extension service soils specialist at Oregon State College, Corvallis, said commercial fertilizer would be needed more and more in Oregon in the future. "This means an expanded fertilizer industry—and we need and will welcome assistance from industry in preparing for this increased use," he added.

Mr. King said simple soil tests are needed in recommending and showing farmers the need for commercial fertilizer and that Oregon county agents are equipped to make tests for lime requirements and available phosphorus.

Canadian soil researchers who attended the session invited the group to meet in Canada some time in the future. Invitations were also received from Oregon and Idaho, as well as Washington, but no decision was reached as to the 1951 meeting location.

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Fertilizer Bids Asked

In an effort to establish sources of supply for 18, 19 or 20 percent superphosphate, and 0-14-14 and 0-20-20 grades of mixed fertilizers, the U. S. Department of Agriculture asked for bids from the fertilizer industry. The specific need was for some 55,000 tons of superphosphate and 35,000 tons of mixed fertilizer to be used this year in the farm program.

All bids were to have been in the hands of the division of purchase, sales and traffic, U.S.D.A., Washington, by August 1.

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NAC Says "Read Labels"

In connection with the recent observance of farm safety week, the National Agricultural Chemicals Association, Washington, D. C., put out a bulletin urging all users of pesticides to read and heed all instructions and cautions printed on the containers of insecticides and other toxicants.

Lea S. Hitchner, executive secretary of the association, pointed out that this is more important than ever before, because so many more kinds and types of materials are now available for use. "Not only are more pounds of chemicals being used, but more kinds and types are available." "This means," he said, "that users are applying new materials, as well as the regular standbys. Both effectiveness and safety begin with reading the label, and the best insurance for successful results is to follow instructions and cautions," he added.

In addition to following directions, he pointed out the importance of selecting products made by a reliable manufacturer, and consultation with the Agricultural College and Experiment Station.

With insect outbreaks setting record levels in some parts of the nation, Mr. Hitchner pointed out that production of many agricultural chemicals is at a record high. With peak production and the tremendous range of materials available, it is possible to control insects, diseases, and weeds more effectively than ever before.

Small-size treater for slurry method. In large-scale use, grain is delivered by chute rather than by hand as shown.

Use of Chemicals in

Cereal Seed Treatment

by

R. W. Leukel

Pathologist, Bureau of Plant Industry, Soils & Agricultural Engineering, U S. Department of Agriculture, Beltsville, Md.

CONTROL of diseases attacking cereal crops — barley, corn, oats, rice, sorghum and wheat — is one of the chief aims of research carried on by the Division of Cereal Crops and Diseases of the U. S. Department of Agriculture. (Also included in this study is flax, although it is not a cereal crop.) There are a number of approaches to the prevention of losses from disease, all of which have as their goal increased crop yields. These include improved cultural methods, breeding productive disease-resistant varieties, or by seed treatment, which is the subject of this discussion.

Testing Fungicides

TESTING the fungicidal effectiveness of materials for seed treatment presents a number of difficulties. One such problem is the matter of obtaining a supply of seed that is sufficiently infected to furnish an adequate test for the fungicides. If the disease organisms are borne entirely on the surface of the seed as in stinking smut of wheat, it is a relatively simple matter to infest the seed, provided a supply of the smut spores is available. But some disease organisms, such as the one causing stripe disease of barley, are placed by nature deeper within the seed in a manner that cannot be duplicated artificially. This makes it necessary to obtain seed from a badly infected crop, or better still, from the seed lot that produced the infected crop. Conditions for invasion of the seed by the fungus may be very unfavorable in certain seasons, even though the percentage of infection in the current crop is high. If lightly infected seed is used for seed-treatment tests, the merits of the fungicides cannot be tested adequately. Again, badly infected seed may be available, but the conditions during the period of germination and early growth may be highly unfavorable for the development of the disease, and the consequent low percentage of infected plants from untreated seed makes the test inconclusive.

Effectiveness in disease control, however, is only one of the standards by which a seed fungicide is judged. Its margin of safety, its effect upon germination, stand and yield, its corrosive effects on machinery, its disagreeable or injurious effects upon persons applying it, its physical properties such as fineness, adherence to the seed, and stability, and last, but not least, its cost per unit of seed treated, must also be considered.

Kinds of Fungicides

MOST of the fungicides used as seed treatments fall in one of three general groups:

1. Mercurials, organic and inorganic
2. Copper and zinc inorganic materials
3. Non-mercurial organic compounds, metallic and non-metallic.

A fourth or miscellaneous group which might be added, includes such materials as hot water, hot vapor, dry heat, sulfur, gases, ultraviolet and infrared rays, and short-wave or high-frequency oscillations. Most of these either have objectionable features or have not been proved effective or practical.

Fungicides differ also in the form or manner of application to the seed. Some are applied as solutions in which the seed is soaked for a period and then dried. The early organic mercurials and copper sulfate or "blue-stone", formerly used for treating wheat, were applied in this manner, as was also the formaldehyde soak, which is still used to some extent. The greatest objection to the soaking treatments is the troublesome drying of the seed. This applies also to the "dip and cover"

method used in applying formaldehyde.

Most of the fungicides for seed treatment developed in the past 20 years were designed for application in dust form at rates ranging from ½ to 3 ounces or more per bushel. The chief objection to this method is the discomfort and danger to health caused by toxic dust in the air. Recently this objection has been overcome to some extent by applying the dusts in the form of a thick soup-like "slurry" which coats the seed with the required amount of fungicide along with the addition of less than 1 percent of water. However, some dust is given off later when the dried treated seed is handled. "Ceresan M", "Arasan", "Spergon" and "Phygon" may be applied in this manner. A more recently developed method of applying certain volatile mercurials in the form of a liquid concentrate has been developed. This concentrate is applied to the seed, in a specially designed treating machine at rates ranging from ½ to 2 or more fluid ounces per bushel, after which the seed is thoroughly mixed and allowed to stand for a day or more before sowing. The seed requires no drying, and the treatment presents no dust hazard. "Panogen" is applied in this manner. This method is similar in principle to the spray or "dry" method used for applying formaldehyde to oats for controlling smuts.

Fungicides for seed treatment are sometimes classified as seed disinfectants, disinfestants or protectants. *Disinfectants* kill organisms within the seed; *disinfestants* kill organisms borne on the surface of the seed, and *protectants* guard the seed against attack by organisms in the soil. Some fungicides belong to all three of these classes and most of them belong to at least two. Practically all seed fungicides (formaldehyde, "Spergon," "Ceresan M", "Phygon" "Arasan", copper carbonate, etc.) are disinfestants since they inactivate surface-borne pathogens. Some organic mercurials are also disinfectants and protectants since, in addition to this, they kill organisms that are borne deeper within the seed and also protect the seed against soil-borne organisms. Various seed treatments act as disinfectants in different degrees. For example, the hot-water treatment, properly applied, kills not only the loose smut fungus deep within the embryo of the wheat or barley kernels but also the more shallow and surface-borne pathogens. The better organic mercurials kill the stripe-disease organism which is in barley seed, but do not reach the loose-smut fungus. Formaldehyde kills the covered smut fungus which is under the barley hull but does not eliminate the stripe-disease fungus. Copper carbonate controls barley smut in hulless barley but not in barley with hulls. On the other hand, the hot water and formaldehyde treatments act as disinfectants and disinfestants but do not act as protectants against soil-borne organisms, while most of the chemical dust seed treatments do. Therefore, in some cases, seed protectants should be applied after hot water or formaldehyde have been used, especially if the soil is badly infested.

In the photo (left). (L to R) two heads of barley infected with loose smut. Two heads of barley with covered smut, as compared to two healthy heads of barley.

Mercurials

INORGANIC mercurials such as mercurous chloride (calomel), mercuric chloride (corrosive sublimate), and mercuric oxide are not used in cereal seed treatment but are used to some extent for treating seeds or tubers of some vegetables.

Organic mercurials have proved to be more effective in cereal seed treatment than any other class of fungicides. This is partly due to the fact that they are more or less volatile, and the fumes penetrate the hulls of such seeds as barley, oats, and some sorghums to reach the disease organisms underneath. "Ceresan" (2 percent ethyl mercuric chloride) was the first organic mercurial to be used widely for cereal seed treatment in the U. S. It is still used to a limited extent on seed of cotton, peas, sugar beets and cereals when more suitable materials are not available. It is generally applied at the rate of 2 ounces per bushel. "New Improved Ceresan" (5 percent ethyl mercuric phosphate) was first marketed in 1933, and soon replaced the 2 percent "Ceresan" for cereal seed treatment. It is less injurious, more effective and less expensive than the older material. It is applied at only ½ ounce per bushel to seed of small grains, sorghum, millet, cotton and peas, and at 1-½ ounces to hemp and flax. It, in turn, is now being largely replaced by "Ceresan M," 7.7 percent ethyl mercuric p-toluene sulfonanilide, which was first marketed in 1948.

This material is applied at ½ ounce per bushel to seed of small grains, sorghum, flax, hemp, peas, millet and other crops for which "New Improved Ceresan" had been recommended. It is fully as effective in disease control and somewhat less objectionable with regard to toxicity, odor, and vesicant action on the skin. An additional advantage is the fact that it can be applied as a slurry.

"Panogen" (2.1 percent methyl mercury dicyan diamide) has been introduced into the United States and Canada from Sweden. It has been an effective cereal seed treatment in Sweden for several years. It is applied in concentrated liquid form at the rate of about one fluid ounce per bushel, usually as a spray in a specially-constructed treater which mixes it thoroughly with the seed. As previously stated, this form of treatment eliminates the disagreeable dust hazard and makes the use of a mask unnecessary. The seed requires no drying, but it should be treated a day or more before sowing. "Panogen" has been found effective in the U. S. and Canada for controlling seed-borne diseases of barley, oats, wheat, flax, and sorghum.

"Leytosan" (7.2 percent phenyl mercury urea), used for cereal seed treatment in Canada, is applied at the rate of ½ ounce per bushel. In general it has been found somewhat less effective than the "Ceresans" and certain other organic mercury treatments.

"Parson's Seed Saver Dust"

Photo (right, L to R): Comparative study of oats: first, plant infected with loose smut. Second, a normal plant, no disease; third, oat plant infected with covered smut.

has been on the market in various forms for about ten years. It formerly contained small percentages of paraformaldehyde and some copper compound, along with a slight trace of mercury. In most tests, it was generally found to be inferior to the standard treatments. In 1947 its active ingredient was changed to 5.15 percent of a compound with the rather formidable-sounding name of para tertiary octyl phenoxy ethoxy ethyl dimethyl mercuric benzyl ammonium chloride. In experiments at various experiment stations it proved to be relatively ineffective in cereal disease control in comparison with other standard seed treatment materials.

Several other organic mercurial fungicides for cereal disease control have been tested the past season in experiments of rather limited scope. Among these are "Benesan", a mixture of ethyl mercuric chloride, phenyl mercuric acetate and benzene hexachloride; "Agrosan", somewhat similar to "Benesan"; "Aagrano", a form of mercury bromide; and "Semenon" and "Mercuran", containing different forms of mercury acetate. Most of these materials are of European origin and have not been tested sufficiently in this country to obtain a true appraisal of their merits.

A zinc mercury chromate compound ("224") proved promising as a seed treatment for corn in experiments in 1949.

Copper and Zinc

COPPER is the metal most commonly used in inorganic non-mercurial fungicides for seed treatment. Copper sulfate has been mentioned as one of the early wet treatments. It is effective also as a dust in finely-ground form, but it is very hygroscopic and soon absorbs enough moisture from the air to render it ineffective for use in this form. Basic copper sulfate, however, retains its dust form and is used to treat wheat for bunt control, and sorghum for kernel smuts. Copper chloride and a number of other copper compounds, if dried and finely powdered, are effective in controlling bunt and some other seed-borne diseases, but like copper sulfate, they take on moisture from the air and soon become unsuitable for dusting seed. In addition to this, some are extremely corrosive. Copper carbonate, of course, is the best known and most widely used copper-containing seed-treatment material. If applied to smutty wheat at the rate of 2 to 3 ounces per bushel, it controls bunt or stinking smut effectively where the soil is not infested with spores. It is recommended also for treating sorghum seed. Copper oxide under such trade names as "Cuprocide", is used as a vegetable seed treatment and also for water-sown rice, but, on the whole, it is not recommended for cereals or flax.

Zinc is not used so widely in fungicides as is copper. Zinc oxide is used to some extent as a treatment for vegetable seed but not for seed of cereals.

Non-Mercurial Organics

FUNGICIDES of this type were developed during the late war when mercury and copper were scarce. A number of them have been found very effective for treating seed of corn, rice, sorghum, flax and vegetables but, in general, they are not recommended for wheat, oats and barley.

"Arasan", (50 percent tetramethyl thiuram disulfide), has been found to be non-injurious to nearly all seeds even when applied at an excess dosage. It is excellent for corn, sorghum and rice at the rate of 1-½ to 2 ounces per bushel, and has given good results with flax if applied at a much heavier dosage.

"Arasan S.F." (a 75 percent product), is used as a slurry treatment and should be applied in a slurry treater according to the directions of the manufacturers.

"Spergon" (98 percent tetrachloroparabenzoquinone), is recommended for the treatment of seed of corn, sorghum and rice at the rate of 2 ounces per bushel. A special wettable form may be used as a slurry.

"Phygon" (50 percent dichloro naphthoquinone), is recommended for application to seed of corn at ½ ounce per bushel, and to rice and sorghums at 1 ounce per bushel. It may be applied also as a slurry.

"Dow 9B" (50 percent zinc-trichlorophenate), is used for treating seed of corn, rice, cotton and certain vegetables.

"Anticarie" (40 percent hexachlorobenzene), is a non-metallic organic dust recommended for the control of bunt or stinking smut of wheat. In experiments in Canada, when applied at ½ ounce per bushel, it proved to be effective for this purpose as well as for improving stands. It is not recommended for other cereals.

Among the non-metallic organic materials, one should not fail to mention formaldehyde, one of the early treatments, which is still used to a considerable extent for treating seed of oats and wheat, and, to some extent, barley.

Fungicides mentioned in this article are produced or marketed as follows:
"Ceresan", "New Improved Ceresan" and "Ceresan M": E. I. duPont de Nemours & Co., Inc., Wilmington, Del.
"Panogen": Panogen, Inc., N. Y.
"Leytosan": marketed by F. W. Berk & Co.
"Cuprocide": Rohm & Haas Co., Philadelphia.
"Arasan" & "Arasan S.F.": E. I. duPont de Nemours & Co., Inc., Wilmington, Del.
"Spergon" & "Phygon": U. S. Rubber Co.
"Anticarie": marketed in Canada by French Dystuffs Ltd., Hamilton, Ont. and in the U. S. by H. P. Rossiger & Co., Inc., New York.
"Dow 9-B": Dow Chemical Co., Midland, Michigan.

Miscellaneous Treatments

MOST prominent among these is the hot water treatment of wheat and barley for the control of loose smut. This is a laborious and exacting procedure that requires great care and also special equipment usually not found on farms. Frequently, for this reason, only a small quantity of seed is treated and this is sown in an isolated field to furnish smut-free seed for the following year.

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The Importance of MOLYBDENUM in Fertilizer

by

Harold J. Evans*

Climax Molybdenum Co.
New York

DEMARCAY in 1900 was the first to demonstrate the presence of molybdenum in plant ash. Scientists since have found trace amounts of the element widely distributed in soils and in plant materials. Its biological importance was not realized until 1930 when Bortels showed that it was beneficial for nitrogen fixation by Azotobacter. This organism grew very poorly in a culture medium without combined nitrogen unless traces of molybdenum were supplied. Bortels' findings, which were confirmed and supplemented by Jensen, Horner, et al, and Mulder, indicate that molybdenum is indispensable for the fixation of gaseous nitrogen by various species of Azotobacter.

The literature concerning molybdenum as a plant nutrient for the period 1930 to 1948 was reviewed by Linz. Some of the more important developments in this period include the discovery by Steinburg that the element is essential for the utilization of nitrates by certain fungi; observations by Jensen, and Bortels that molybdenum is highly beneficial for atmospheric nitrogen fixation by the nitrogen-fixing bacteria of legumes; and reports by Piper, Arnon and Stout that higher plants also require molybdenum. In 1942 and 1946, Anderson reported very striking cases of molybdenum-deficiency on acid soils in Australia in areas of high winter rainfall. Applications of molybdate increased both yield and nitrogen content of legumes, but non-leguminous plants showed no response. Lime benefited molybdenum-deficient clover but did not improve normally nodulated clover that had been supplied with molybdenum. As a result of these experiments, large areas of Australian pastures are now being treated with two ounces molybdenum trioxide per acre to increase nitrogen fixation of leguminous plants. Other field responses to molybdenum have been reported by Frieke in Tasmania, Lavollay in France, and Davies in New Zealand. Most of the responses involved legumes grown on acid soils.

The most conclusive experiments on the essentiality of molybdenum for plant growth have been reported since 1948. A very definite molybdenum requirement for normal growth of tomato, cauliflower, cabbage, and mustard plants was demonstrated by Hewitt and Jones. They pointed out that previous methods of purification of nutrient salts were not adequate for removal of molybdenum. By use of a special purification process these workers contributed valuable information on the requirement and function of the element in four plant species. Two weeks after planting, tomato plants in pots of sand without it showed yellow-green mottling of leaves, which was followed by necrosis and shrivelling of their tips. Cabbage, cauliflower, and mustard plants lacking molybdenum developed an intervenial pale-yellow that increased in severity until the leaves completely withered. Younger leaves emerged as bare petioles without laminae. Leaf extracts from deficient plants contained very high concentrations of nitrates and, therefore, it was concluded that molybdenum was required for nitrate reduction in plant metabolism.

Mulder recently described molybdenum deficiency of tomatoes, oats, and barley in nutrient solutions and reported an accumulation of nitrates and a decrease in the protein content of deficient tissues. The requirement for this element was greatly lowered where ammonium nitrogen was used instead of nitrates. Mulder also studied the nutrition of nodulated peas grown without molybdenum and combined nitrogen and found that they quickly developed nitrogen-deficiency symptoms. If adequate molybdenum was added, no deficiency was observed.

Since requirements for plant growth are smaller for molybdenum than for any other known essential element, plant scientists have been forced to use special techniques in studying this nutrient. Recently Vanselow and Datta used a concentration procedure and a spectrograph to measure the molybdenum requirements of the lemon plant. They reported that leaves containing more than 0.024 ppm. molybdenum were normal but those containing 0.01 ppm. were deficient. Deficiency was produced with either nitrate or ammonium nitrogen. Stout and Meagher, using radioactive molybdenum, demonstrated an accumulation of the element near the stomatal openings and found a correlation between phosphorus and molybdenum absorption.

* Abstract of thesis submitted in June, 1950, in partial fulfillment of the requirements for the Ph.D. degree at Rutgers University, New Brunswick, N. J.

The work of Millikan indicated that the molybdenum requirements of plants are greatly influenced by the concentration of other ions in the nutrient substrate. Chlorosis of flax induced by high concentrations of either manganese, zinc, copper, cobalt, or nickel was greatly reduced when increasing concentrations of molybdenum were supplied. Manganese toxicity of field-grown flax was cured by an application of 1 or 2 pounds of ammonium molybdate per acre. He concluded that molybdenum functions in the utilization of iron by plants and suggested that plants grown on highly acid soils may suffer from manganese toxicity and molybdenum deficiency, since manganese is more soluble in an acid than in an alkaline medium, whereas the reverse is true of molybdenum.

Until recently, the only definite evidence of molybdenum deficiency in soils in the United States was that reported by Walker in California. Tomato plants grown in pots of a barren serpentine soil developed chlorosis that was cured by additions of molybdenum. Analyses showed that deficient plants contained less than 0.1 ppm. of the element. Bear and Wallace found that top-dressings of molybdenum produced increases in the nitrogen content of New Jersey alfalfa, but no yield responses or deficiency symptoms were observed.

Experiments in New Jersey

THE literature indicates that there is relatively little information on the molybdenum status of crops and soils in the United States. Since New Jersey farmers have found it increasingly difficult to maintain alfalfa stands, studies were conducted to determine whether the soils of New Jersey supplied adequate molybdenum for maximum nitrogen fixation and yield of alfalfa. This problem required additional information on the nature of molybdenum deficiency symptoms, how much molybdenum is needed, and its effect on partial chemical composition of the plants.

In 1945 Hoagland reviewed the literature on the importance of molybdenum for plant growth and came to the conclusion that there was no conclusive or even strong evidence that molybdenum was necessary for nitrogen fixation by legumes. The initial experiments conducted in New Jersey, therefore, were designed to obtain fundamental knowledge on the molybdenum nutrition of alfalfa. Studies were made on the molybdenum nutrition of alfalfa grown with culture solutions in pyrex glass with distilled water and highly purified nutrient salts. Four cuttings of alfalfa were grown in solutions containing nitrate nitrogen and variable molybdenum concentrations. The fifth and sixth cuttings were provided with molybdenum at rates of 0, 0.001, 0.015, and 0.10 ppm., and the plants were forced to utilize atmospheric nitrogen instead of nitrates.

Plants receiving nutrient solutions containing nitrates and no molybdenum — developed deficiency symptoms, as indicated by light green upper leaves and chlorosis of the lower leaves. In severe cases, the lower leaves became necrotic and abscissed. Treated plants yielded from 12 to 37 per cent more dry matter containing from 4 to 28 per cent more nitrogen than plants without molybdenum. Nitrates accumulated in molybdenum-deficient plants, which indicated the importance of this element in nitrate metabolism.

After the combined nitrogen was eliminated from the nutrient solutions and the cultures were inoculated, all plants developed severe nitrogen-deficiency symptoms. Within three weeks, molybdenum treated plants regained their green color and succulence, but those without molybdenum remained nitrogen-deficient. Upper leaves of molybdenum-deficient plants were chlorotic. Many of them later showed necrosis of tips and margins, while lower leaves became necrotic and abscissed. Molybdenum — treated alfalfa utilizing atmospheric nitrogen yielded from 63 to 71 per cent more dry matter than untreated plants in the fifth cutting and 334 to 352 per cent in the sixth. The nitrogen content of treated plants from these cuttings was 47 to 92 per cent higher than that of untreated plants. Nutrient solutions containing 0.001 ppm. produced plants containing 0.1 to 0.5 ppm. molybdenum. This concentration was sufficient for maximum yield and nitrogen fixation. From the results of this experiment, it was concluded that molybdenum is essential for nitrogen fixation by alfalfa and highly beneficial for the utilization of nitrate nitrogen.

Field surveys were conducted to study the effect of soil reaction on the availability of molybdenum in New Jersey. Analyses of samples of alfalfa and red clover collected from various soil types in New Jersey showed that those samples from soils with pH value below 5.5 usually contained less than 0.4 ppm. molybdenum. Those from naturally acid coastal plain or upland soils that had been limed to pH values from 6.4 to 7.3 contained between 0.7 and 3.5 ppm. Alfalfa from soils of limestone origin that were naturally neutral or only slightly acid in reaction contained between 0.1 and 0.4 ppm. molybdenum. Alfalfa from experimental plots on a naturally acid soil that had been limed to pH values between 6.1 and 6.5 contained between 0.7 and 1.1 ppm. molybdenum, but that from plots limed to pH values between 6.9 and 7.6 contained between 1.6 and 3.0 ppm. Experiments proved that the increased qualities of molybdenum found in plants on heavily-limed soils came from the soil and not from the liming materials. These results indicate that molybdenum is present in acid soils in an unavailable form but that it is made available by liming the soils to near neutrality. Naturally neutral or slightly acid soils in areas of high rainfall have lost most of their available molybdenum through years of leaching.

The effect of soil reaction on the availability of molybdenum in Norton silt loam, derived from Triassic shale, was studied in a pot experiment. Alfalfa was grown in four series of cultures adjusted to pH values of 4.3, 5.5, 6.5, and 7.5 and treated with $Na_2MoO_4.2H_2O$ at the rate of 5 pounds per acre. Another four series were adjusted to the same pH values, but molybdenum was omitted. Inoculated alfalfa was grown in these pots, and three cuttings were harvested. In the first two cuttings,

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Numerous Topics on Agenda for Seventh Annual Meeting of

Natl. Agricultural Chemicals Assn.

Ernest Hart
To Give Presidential Address

Problems facing industry including Sabath Resolution, to be discussed at three-day session in N. J.

Avery S. Hoyt
New B.E.P.Q. Chief on Program

THE seventeenth annual meeting of the National Agricultural Chemicals Association, scheduled to be held at the Essex & Sussex hotel, Spring Lake, New Jersey, features a program designed to review progress made in the industry, the long range outlook in the field of agriculture, and various matters connected with the current F.D.A. residue tolerance hearings. Dates of the meetings are September 6, 7, and 8th.

While the entire program plan was not yet completed at press time, several recognized leaders in the agricultural chemicals field and areas closely related have accepted invitations to appear on the program, the Association announced. Such speakers include: Avery S. Hoyt, newly appointed Chief, Bureau of Entomology and Plant Quarantine, U.S.D.A., Dr. Bernard E. Conley, American Medical Association, Dr. Victor R. Boswell, Assistant Chief, Bureau of Plant Industry, Soil and Engineering, U.S.D.A., Dr. S. A. Rohwer, Assistant Chief, Bureau of Entomology and Plant Quarantine, U.S.D.A., Dr. Charles L. Smith, Ethyl Corporation, W. Mercer Rowe, Jr., Flag Sulphur & Chemical Company and J. M. George, Interstate Manufacturers Association.

Association speakers include: Ernest Hart, president, National Agricultural Chemicals Association, Lea S. Hitchner, executive secretary and John D. Conner, special counsel.

The Traffic, Technical Advisory, Legislative, Information and Lawyers Committees of NAC are scheduled to hold meetings Thursday morning September 7 to review various phases of industry activity. Brief reports of committee actions and activities will be presented during the regular business sessions which are scheduled for the mornings of September 6 and 8.

From a long range viewpoint many members of the industry have been heartened at the growing recognition being given insect, disease and weed control by agricultural authorities and organizations. It is expected that this movement will be appraised relative to the activities of members of this industry and in cooperation with both government and private agencies.

Along with the review of the residue tolerance hearing, it is expected that some general discussion will be devoted to the pending congressional investigation scheduled by virtue of the passage of (HR 323) the Sabath Resolution.

L. S. Hitchner
Reports on Association Activities

Agricultural insect enemy No. 1 in Canada this year again was the grasshopper. Agricultural chemical No. 1 for control of the grasshopper this year in Canada was ALDRIN. ALDRIN was chosen on the basis of results of rigorous tests conducted under the supervision of Canadian Agricultural Experiment Stations. ALDRIN'S effectiveness and economy can best be evidenced by the following dosage used by the Canadians: **2 ounces of ALDRIN to the acre.**

ALDRIN'S gradual volatility affords protection from 'hoppers up to a week at recommended dosage levels and at the end of two weeks, no ALDRIN residue can be detected on treated foliage by chemical analysis.

Over two million acres of crop (largely wheat), and range land in Alberta, Manitoba and Saskatchewan have been sprayed, dusted and baited with ALDRIN this year. The performance of ALDRIN in Canada for grasshopper control establishes a new record for *effectiveness* and *economy*.

Registration of ALDRIN for grasshopper control in the United States is anticipated this year.

It is not too early now to plan next year's formulations and sales campaign for ALDRIN insecticides for grasshopper control. The new low cost per acre treatment means a greatly expanded market in 1951.

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NFA Sponsors New England

Fertilizer Pasture Tour

THE week's Green Pasture Tour through the six New England States was a success from every standpoint, according to those who participated in the trip which began on July 10 at Providence, Rhode Island. In charge of the tour was Dr. S. D. Gray, northeast manager of the American Potash Institute. Sponsors were the Plant Food Research Committee of the National Fertilizer Assocation, and the state colleges of New England.

Although the use of fertilizer on all types of pastures caused marked improvement of the yield, the greatest successes were noted where farmers planted Ladina clover in the grass, using generous applications of fertilizer. Emphasis was laid on the fact that "it is cheaper to buy fertilizer than to purchase feed for livestock." Production of good feed on many farms was pointed out as being far in excess of the cost of the fertilizer which made such increases possible.

On the 400-acre farm of J. B. Abbott, Rockingham, Vt., more than 18 tons of fertilizer were applied in the fall of 1949 and the spring of 1950; plus 16 tons of lime to correct the pH of the soil. Thanks to this heavy application, a net profit of $5,305 was realized from the 125 acres of cropland and improved pasture. The major enterprises on this farm are the raising of purebred Holstein-Friesian cattle, and poultry.

Two farms of the Bahler brothers, Ellington, Conn., were examples of good use of fertilizer on pasture land to bring in increased income. Since 1930, the brothers have kept records of their pasture improvement programs on the two farms, and in the intervening years a number of honors have come their way through this program. Planting sweet clover for the most part (a new idea when they began their enterprise 20 years ago), they were awarded first prize in their county in the State Dairymen's Extension Service contest, and in 1936 they won second county prize. In 1937, however, the grand prize for the state was presented to them. In 1949, they were given the highest score in Connecticut and were rated high in the All-New England contest.

Itinerary of the tour took the group to the Kingston, R.I., agriculture experiment station; the pasture fertility plots at the Storrs, Connecticut, station; the University of Connecticut; and the experimental pasture plots at Durham, New Hampshire.

Participating in the tour were representatives of industry, the NFA, the U. S. Department of Agriculture, the Soil Conservation Service, agricultural instructors, bankers and farmers. County agents were on hand to help direct activities in their areas, and numerous interested persons accompanied the tour through portions of the trip. From 60 to 70 persons were on hand most of the time.

Making the trip, however, were representatives from all of the New England States, Kentucky, Ohio, Virginia, North Carolina, Illinois, Pennsylvania, Maryland and New York.

Committees in charge of the tour, working with Dr. Gray, in-

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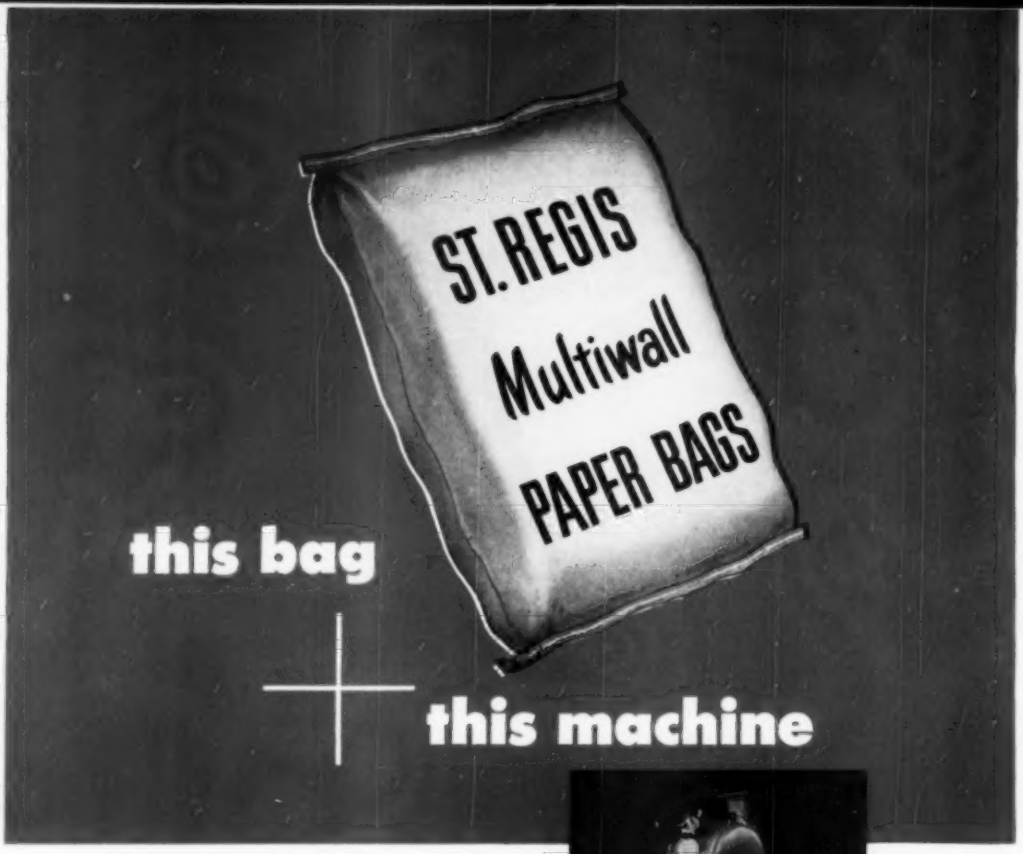
Part of group on fertilizer tour looking over the experimental plots at Durham, N. H. Photo by University of New Hampshire.



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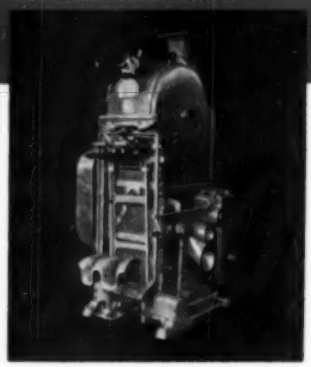

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How toxic to plants are some of the

NEW INSECTICIDES?

by

Arthur C. Foster

DURING the past four years, phytotoxicity studies with a number of the organic chlorinated hydrocarbon insecticides have been conducted at the Plant Industry Station in greenhouse beds, cold frames, and field plots. The materials used in these tests include DDT, BHC, toxaphene, chlordane, and more recently "Rhothane," "Marlate," lindane, parathion, aldrin, dieldrin, certain of the purified isomers of BHC, and certain of the purified isomers or analogs of DDT.

In these experimental studies, the major objectives are:

(1) To determine the phytotoxicity of a soil residue of those organic insecticides—(a) when mixed in different amounts in different types of soils, (b) when allowed to accumulate in the soil after repeated application to plant foliage and the soil surface, so as to simulate normal field use. (2) To determine the stability and permanence of the organic insecticides in the soil—(a) after direct mixing with the soil (field and cold frame plots); (b) after repeated application to plant foliage and the soil surface (orchard soils and cold frame plots).

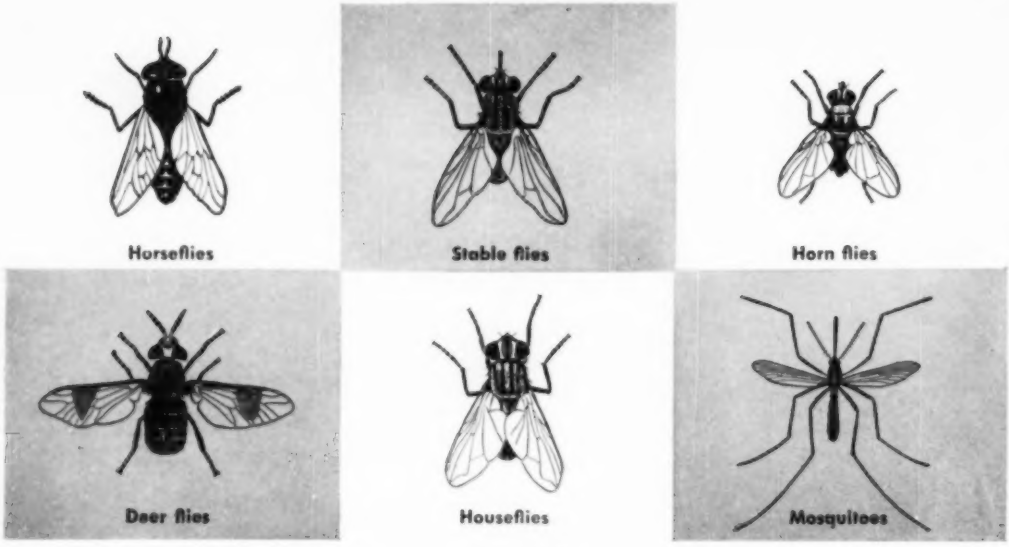
The major reproducible results obtained to date are summarized briefly:

First, it is important to emphasize that different crops and also different horticultural varieties and breeding lines of a given crop may respond differently to the same chemical. Many crops may be sensitive, others highly tolerant, and some may be stimulated in growth by certain insecticides or fungicides under some experimental conditions. Foliage sensitivity is not always a reliable criterion for root sensitivity, nor is root injury a criterion for foliage sensitiveness. Retarded growth may occur without any definite observable symptoms.

For these reasons generalized conclusions may be unreliable. The degree of phytotoxicity of a soil residue or foliage spray may vary with the formulation used—ground dust, impregnated dust, emulsion, wetting agent, or solvent. Other factors that may affect phytotoxicity are soil types, especially soil colloids, soil pH, and possibly the form of lime used (high calcium vs. high magnesium). A given quantity—not necessarily an accumulated residue—of some of the organic insecticides that are volatile (BHC, lindane, and parathion) or that have a high vapor pressure is sometimes more toxic in the soil than an equal amount of the more stable insecticides. The technical grades of these organic insecticides are not pure chemical substances but are made up of several different chemical compounds; these non-insecticidal components may often be the major offenders in causing phytotoxic effects or off-flavors.

DDT mixed in muck, Chester, Sassafras, and Evesboro soils (replicated plots) at 25 pounds acre or more in August 1945, and exposed to outdoor weathering, has appeared to remain stable, to persist without detectable change in toxicity to sensitive crops, remaining toxic to successive

Mr. Foster is Senior Pathologist, Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, Soils and Agricultural Engineering, U.S.D.A., Beltsville, Md.



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fall and summer plantings of certain sensitive vegetable and grain crops through December 1949. Chemical analyses of these soils (by Louis Koblitsky, Bureau of Entomology and Plant Quarantine) indicate no significant measurable change in amount of DDT present in these soils after 4 years.

DDT incorporated into the soil of replicated randomized field plots in 1947 at 25 pounds per acre or more, has persisted to date, and has continued to reduce growth and yield of Black Valentine and Stringless Green Pod beans, Abruzzi and Rosen rye, and Lee oats.

Technical BHC (containing 12% gamma) mixed with Chester soil at 100 pounds per acre in September, 1946, persisted to December, 1949 and has continued to be toxic to certain crops, and imparting the characteristic off-flavor to potatoes. Some tasters reported off-flavor in cooked lima beans and snap beans grown in this soil in 1949; others were unable to detect any off-flavor. Chemical analysis of this soil (tested by Dr. Chisholm) indicates that about half of the original BHC applied has disappeared, but the off-flavor effect has definitely continued to be produced in below-ground plant parts.

During the summer of 1949 soil from a peach orchard at the Plant Industry Station was put in benches in a greenhouse to test for the presence of toxic residues. Soil was taken from under the limb spread of the peach trees, from between the trees, and from an adjoining site which had not been sprayed with either fungicides or insecticides. The soil from the adjoining site was used as a control. Four replicates of each lot of soil were established on greenhouse beds 3' x 4' and 6" deep. This peach orchard had been sprayed 1946 to 1949, inclusive, with a total of approximately 120 pounds per acre of DDT and 50 pounds per acre of technical BHC. In previous years, this peach orchard had been sprayed with sulfur, arsenate of lead, and zinc-lime. The soils under the trees were very acid (pH 3.4) and this was adjusted to pH 6.5 by the addition of both high calcium and high magnesium lime. The high acid nature of the soils under the trees apparently made conditions more favorable for leaching of the arsenic to deeper soil levels. Analyses of soils for As_2O_5 (by Drs. Roark and Chisholm,) indicated 385 ppm. under the limb spread of the trees and 204 ppm. between trees. The zinc content of the soil was slightly lower under the trees than between trees.

Since removal of these soils to the greenhouse, four successive plantings of vegetable crops have been made, including several varieties of snap beans, also yellow and blue lupines, wheat, and Rosen and Abruzzi rye. The soils collected under the limb spread of the peach were found to be toxic to all the crop plants tested except wheat. There was some toxicity in the soils collected from between the tree rows when compared with the soil from the adjoining site. Growth of rye, which is sensitive to DDT and BHC and tolerant of arsenic, was especially poor on the soil from under the trees, normal on the controls, and intermediate on soil from between the trees. Wheat, which is sensitive to arsenic, was equally good on all three soils. This is considered a typical example of the accumulation of a residue of insecticides when used in actual practice. Rye crops are known to be sensitive to DDT and BHC and to be tolerant of large amounts of arsenic (according to Cooper). The root symptoms developed by the bean and lupine crops were characteristic of symptoms caused by DDT and BHC. It is possible, of course, that some of the harmful effects on the legumes were caused by arsenic, although wheat appeared unharmed by it.

Just how long a given toxic amount of DDT, BHC, chlordane, "Rhothane," "Marlate," aldrin, dieldren, or toxaphene will remain toxic to sensitive crops in soil, is not yet known. "Rhothane" and "Marlate" are similar chemically to DDT and might be expected to have similar stability in soil. Chlordane has persisted in Chester soil for 1 year without any change that could be determined by plant responses. Toxaphene in Chester and Chester-compost soil appeared to lose its toxicity for sensitive plants after 4 to 6 months. Parathion apparently disappears from soils rather rapidly, as measured both by plant response and chemical analyses (by Drs. Roark and Carter).

In these experiments, many different crops have been grown which represent widely different plant families, genera, species, and horticultural varieties. From these experiments, a large mass of data representing many different effects of some of these insecticides on plant growth is now being prepared for publication. Many of the crops tested appear to be fairly tolerant of some of the insecticides, but sensitive to others. The presence of DDT (100 pounds per acre) in the soil has consistently and repeatedly accelerated pre-and post-emergence "damping-off" of the *Leguminosae* crops tested. Technical BHC at the same rate has consistently and repeatedly tended to inhibit both types of damping-off, which suggests some fungicidal or fungistatic effect.

BHC (100 pounds per acre, technical) appears to be toxic to many plants from different families, genera, and species. In the soil, the gamma BHC (lindane) appears to be just as toxic *pound for pound* as the technical material. The delta isomer of BHC is highly toxic to all plants tested when used as a wettable spray (2.5 pounds pere acre). Lindane at the same rate of spray has not been toxic to the crops tested. ★★

How long will DDT, BHC, chlordane, aldrin, dieldrin or toxaphene remain toxic to sensitive crops in soil? Answer not yet known, but indications are that some compounds may persist in soil for more than one season. Studies continue.

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Resumption of Washington FDA Hearing Reports on

TOXICITY of PESTICIDES

by

John D. Conner

Special Counsel.
National Agricultural Chemicals Ass'n.,
Washington, D. C.

THE spray residue tolerance hearing, conducted by the Food and Drug Administration, in recess from May 22, resumed on July 10 with the taking of evidence under part "D," on the toxicity of various pesticidal compounds. At the end of ten days, the proceeding was so far ahead of the schedule originally set up that a recess until July 27 was called. At that time, evidence was to be presented on the toxicological properties of methoxychlor.

The first subject on which evidence was presented at the reconvened hearing was lead arsenate and other arsenicals. Dr. Paul A. Neal, of the National Institute of Health, voiced the opinion that a tolerance on apples and pears of 0.05 grain of lead per pound and of 0.025 grain of arsenic trioxide per pound would not be injurious to consumers of these fruits.

Dr. Edwin P. Laug, of the Food and Drug Administration, contended that the ingestion of more than 5 milligrams of arsenic oxide daily would constitute a health hazard and that the daily consumption of 3 milligrams of arsenic trioxide would be hazardous to health.

Dr. Robert A. Kehoe, a director of the Kettering Laboratory, Pittsburgh, testifying on his own behalf, stated that the presence of lead in living forms is inevitable. An important factor, in his opinion, is not alone the amount of lead in a specific food but the extent to which that food enters the diet.

Dr. Neal resumed the stand briefly to testify that an average daily ingestion of 5 milligrams of DDT would not be dangerous to human beings.

The next witness on DDT, Dr. O. Garth Fitzhugh, of the Food and Drug Administration, reviewed experiments with feeding of DDT to laboratory animals. He stated that a daily ingestion of 2.5 milligrams of DDT would provide five-fold margin of safety for the consumer.

The testimony of Dr. Francis F. Heyroth, also of the Kettering Laboratory, was based on a review of the literature on the toxicity of DDT. In commenting on the opinions of Drs. Fitzhugh and Neal as to amounts of DDT which might be safely ingested, he observed that their only error might be that of over-caution.

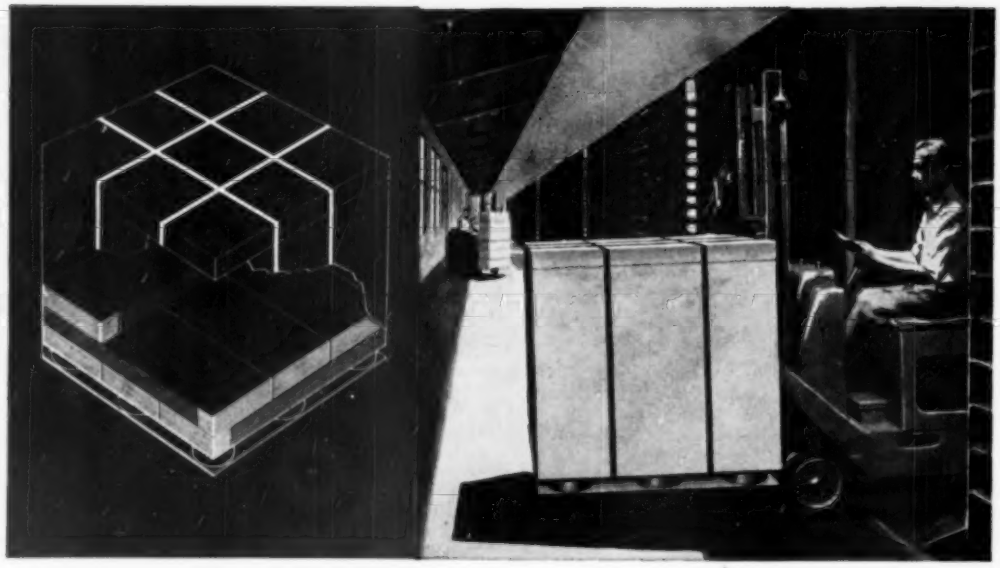
Dr. Edward F. Knipling, Bureau of Entomology and Plant Quarantine, U.S.D.A., reviewed experiments to determine the toxic effects of spraying livestock with DDT and of feeding DDT-sprayed forage. He also repeated the current recommendations of BEPQ on the use of DDT on dairy barns. His testimony was supplemented by Ray E. Ely, also of BEPQ.

Dr. Clyde Biddulph, of Utah State Agricultural College, described experiments in feeding alfalfa treated with DDT dust and alfalfa treated with methoxychlor to cattle, sheep, chickens, chicks and turkey poults.

Dr. Bert J. Voss, of the Food and Drug Administration, discussed the pharamacological properties of "DFDT." He stated that he considers it to be a poisonous or deleterious substance and although admitting that not enough work had been done on which to base an opinion as to the amount which might be ingested safely, he believes that the safest procedure would be to consider it at least as toxic as the most toxic member of the group to which it belongs.

Geoffrey Woodward, of the Food and Drug Administration, described a preliminary laboratory experiment with "DMC," which he considers a poisonous or deleterious substance, the continuous ingestion of small amounts of which would constitute a health problem. "DMC," in his opinion, must be assumed to be at least as toxic as DDT. He summarized information on the toxicity and pharmacological properties of phenothiazine as obtained by a search of scientific literature. He believes the daily ingestion of 10 milligrams of phenothiazine, which he classifies as a poisonous or deleterious substance, would probably be safe.

Dr. John P. Frawley, of the Food and Drug Administration, discussed investigations concerning the pharmacological properties of parathion. A 50 kilogram adult could in-



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gest 2.5 milligrams of parathion daily without ill effects, and a 20 kilogram child could ingest 1 milligram daily. Due to the similarity of its methyl homolog to parathion, a combination of the two when ingested must be considered additive and, in Dr. Frawley's opinion, the continuous ingestion of 1 milligram daily total parathion and methyl parathion would be safe for children and adults.

Dr. Lloyd W. Hazleton, owner of Hazleton Laboratories, testified on behalf of the American Cyanamid Company. He discussed thoroughly experiments with use of parathion on laboratory animals and the effectiveness of antidotes in combatting the toxic effects of this insecticide. He stated that he agreed with Dr. Frawley that 2.5 milligrams of parathion ingested daily would be quite safe.

Dr. Clinton H. Thienes, School of Medicine of the University of Southern California, discussed experiments in feeding rats parathion-sprayed oranges and their products. On the assumption that man and rats are equally susceptible to chemical agents, he stated that Dr. Frawley's estimate of 2.5 milligrams was unusually conservative and well on the side of safety.

Dr. F. C. Fountaine, Professor of Dairy Husbandry, Kansas State College, described experiments in feeding dairy cattle parathion in capsules and in wettable powder.

Dr. William B. Deichmann, Associate Professor and head of Division of Pharmacology, Albany Medical College, testifying on behalf of the Geary Chemical Corporation, described experiments on the toxicity of dimethyl para nitrophenyl thiophosphate and its diethyl derivative, as well as mixtures of 80% of dimethyl and 20% of diethyl derivative.

Ernest C. Hagan, of the Food and Drug Admistration, described a preliminary experiment on glyoxalidine.

Henry F. Smith, Jr., of the Mellon Institute, testifying on behalf of Union Carbide and Carbon Company, discussed experiments with 2-heptadecyl glyoxalidine. Dr. C. Boyd Shaeffer, also of the Mellon Institute, described studies made to determine the behavior of 2-heptadecyl glyoxalidine in the animal body.

Ernest C. Hagan resumed the stand to describe experiments to determine the acute oral toxicity of laboratory animals to "CS 645" and "CS 647."

Joseph N. Spencer, of Commercial Solvents Corporation, presented toxic studies on "Dilan" and stated that acute toxicity studies with laboratory animals have been made with "Dilan," "Dilan 25 EM," "645-A" and "647-A." Toxic data was also obtained on DDT and methoxychlor DDT. In his opinion, 10 milligrams may be ingested daily without any injurious effects.

Dr. Jack London Rodamski, of the Food and Drug Administration, defined "Lethane 60" and "Lethane 384" and discussed experiments in which the acute oral toxicity of this chemical was determined.

Dr. Fitzhugh, testifying for the Food and Drug Administration: Dr. Knipling, testifying for the Department of Agriculture; and Dr. Lemuel C. McGee, Dr. Herman Shelanski and Dr. Joseph F. Teon, testifying upon behalf of Hercules Powder Company, presented evidence on the toxicity of toxaphene. Estimates of these witnesses of a safe level of toxaphene, based upon information now available, ranged from an intake of 2.5 milligrams per day to one of 100 parts per million of total diet.

Dr. Laug was recalled by the Food and Drug Administration to present testimony relating to the toxicity of selenium. He stated that, on the basis of existing data, he was not prepared to establish any level at which selenium could be ingested without possibility of injury. Dr. Harold N. Wright, testifying upon behalf of McLaughlin Gormley King Co., stated that, in his opinion, selenium at a level of two parts per million of total diet would not be injurious.

Mr. Woodard, upon behalf of the Food and Drug Administration, and Dr. Hazleton, upon behalf of Stauffer Chemical Company, presented testimony relating to para chlorophenyl sulfone ("R-242)." Dr. Rodamski and Dr. Hazleton then testified on xanthates. Mr. Woodard was recalled and presented testimony on xanthone.

The concluding testimony on July 20, before the hearing was recessed until July 27, related to tartar emetic. This testimony was given by Dr. Laug, for the Food and Drug Administration, and by Dr. Hazleton, on behalf of Stauffer Chemical Company.

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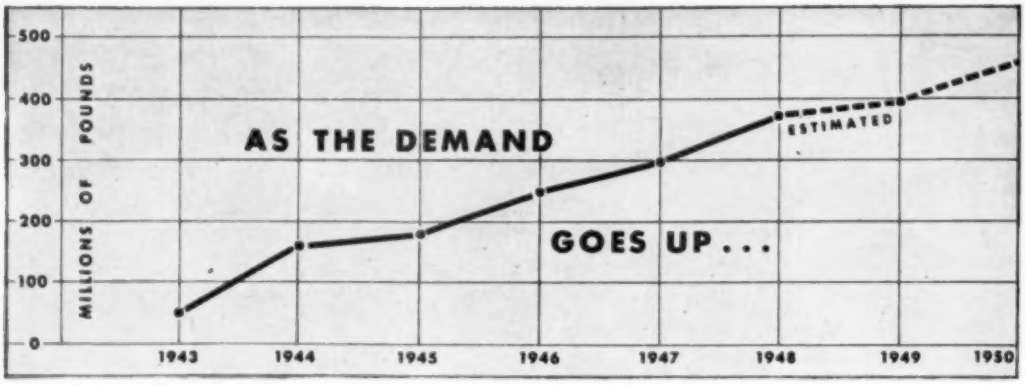
Weed Association Formed

FORMATION of the "Association of Regional Weed Control Conferences" has been announced by Dr. H. L. Yowell, Esso Laboratories, Linden, N. J., president of the Northeastern Weed Control Conference. Officers of the new national group which is composed of the four regional weed control organizations are: W. S. Ball, Sacramento, California, chairman; R. S. Dunham, University of Minnesota, Vice-chairman; and R. L. Lovvorn, in charge of weed investigations, U.S.D.A., secretary-treasurer.

The national weed control group was formed in a recent meeting of representatives of the four regional organizations at Kansas City. Representing the Northeastern Conference at this meeting were Dr. Yowell and Dr. R. D. Sweet, Cornell University; North Central Conference, Dr. Dunham and Dr. W. W. Worzella, Brookings, S. Dakota; Southern Conference, Dr. E. C. Tulis, Beaumont, Texas; and Western Conference, Mr. Ball. In addition, Dr. Lovvorn was present to represent the U.S.D.A.

A decision was reached to poll the membership of the regional conferences at their coming winter meetings, and if approval is given, steps will be undertaken to arrange a national meeting probably late in 1951.

The purpose of the new organization is "to coordinate the activities of the member conferences on weed control problems of national scope." This applies to all phases of weed control, including educational and regular work, as well as research. Since close cooperation is now regarded as a necessity, the new organization expects to keep its members informed of progress through Association-sponsored bulletins.



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The Listening Post

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Dr. Haeussler is in charge of Insect Pest Survey and Information, Agric. Research Adm., B. E. & P. Q., U.S.D.A. His observations are based on latest reports from collaborators in the department's country-wide pest surveys.

By G. J. Haeussler

Grasshoppers

COOPERATIVE State and Federal baiting operations to control grasshoppers on range areas in Wyoming got under way during the latter part of June. Despite the fact that unfavorable flying weather hampered the work somewhat during the first half of July, more than a million acres had been baited through July 17. On a single day, July 13, 35 planes under contract baited more than 101,000 acres. Good control was reported from all areas of Wyoming except where certain range species of 'hoppers predominated.

Grasshopper infestations were on the increase in eastern and north-central Montana during late June and early July. To halt increasing crop damage, farmers in several north-central and northeastern areas were conducting spraying operations during July. Around the middle of the month, infestations were especially threatening in northern Sheridan County along the Canadian line.

As a result of nymphal mortality due to continued wet weather, grasshopper infestations in north-central North Dakota developed slowly and were less severe than had been anticipated. In the southwestern part of the state, spraying was conducted on a large scale by farmers and contract operators during the first half of July to control heavy infestations. Toxaphene and chlordane sprays were providing good control.

Infestations of *Camnula pellucida* expanded rapidly during the first half of July in the Black Hills area of southwestern South Dakota. Baiting operations were carried on by farmers and ranchers who became alarmed at the large number of the species. Grasshopper infestations were also more serious than had been expected in the central portion of South Dakota as a result of extended drought.

Extensive spraying and baiting operations were carried on by farmers in southwestern Oklahoma during the last part of June and early July to save alfalfa seed and cotton crops from heavy damage by grasshoppers which were moving from drying marginal vegetation into these crops, but good controls were reported.

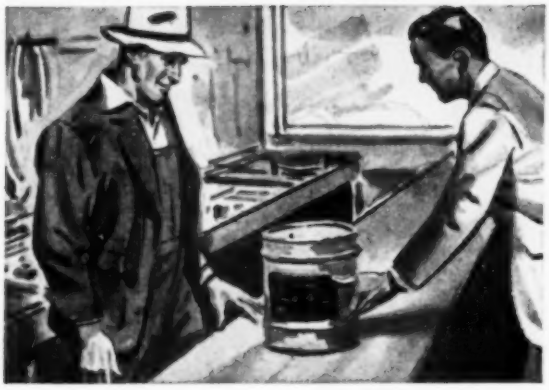
Surveys conducted early in July showed economic grasshopper infestations present throughout much of the Texas panhandle. Farmers in some areas were applying chlordane sprays to marginal vegetation, but sodium fluosilicate bait was the chief control measure used.

A cooperative range-baiting program to control grasshoppers in Quay and Guadalupe Counties, New Mexico, was undertaken early in July.

Workers in the Bureau of Entomology and Plant Quarantine report that extensive experimental trials of aldrin against grasshoppers have given very promising results. Further information is needed, however, on the question of possible undesirable residues that may remain on treated vegetation before this material can be recommended. The first tests with aldrin against grasshoppers made were in Montana in September 1948. In 1949 the material was tested further on alfalfa in Arizona and on range grass in Arizona and Montana. Results of the 1949 tests indicated that sprays containing as little as 1½ to 3 ounces of aldrin per acre gave from 75 to 100% control 3 to 4 days after application.

European Corn Borer

HEAVY European corn borer infestations are developing in Illinois and Iowa. Emergence of corn borer moths was practically complete in Illinois by July 8 and egg laying was nearing the end. High winds and beating rains had destroyed many moths and removed many egg masses from the plants in some areas. Prolonged cool wet weather prevented the extreme build-up in egg populations in some parts of Iowa that had been expected. In Indiana, egg laying was also nearly complete by July 6. Infestations have remained low and no serious first brood damage is expected there. In south-central Kansas the European corn borer infestation varied from light to moderate early in July, being mostly light or absent in the more southerly counties, but increasing in severity in counties further north and east. Infestations of the southwestern corn borer varied in the opposite direction, being light in north-central Kansas and heavier in the counties at the southern border of the State. Conditions in Maryland early in July indicated the most severe European corn borer potential since 1947 in Frederick, Washington, and Carroll Counties. Most early fields have a high borer count. Emergence of the moths was practically complete in southern Minnesota by July 10 and from 50 to 75 percent complete in the central part of the State. Most first generation moths had completed egg laying in Nebraska by July 8 and no serious outbreak is expected. The borers have appeared along the Platte River as far west as Dundy County, but not in sufficient numbers to warrant treatment. Activity of adult moths and egg laying was almost complete by July 5 in southern and central counties of New Jersey and was declining rapidly in the northern counties. Tassel and stalk damage by the larvae were moderate to severe throughout the principal sweet corn counties. Corn borer moths were just starting to lay eggs in the southeastern



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counties of North Dakota by July 7. Emergence of first generation moths was completed in Ohio by that date, egg deposition had practically ended in the southern counties, and was on the decline in other parts of the state.

Cotton Insects

HOT, dry weather during mid-June helped to hold the boll weevil in check over most of the area where this pest occurs. However, conditions became generally more favorable for the weevils during the latter part of June and early July and by the middle of that month entomologists reported the situation as "extremely critical." Insecticides were being used by more farmers and in larger quantities than ever before for boll weevil control. Shortages of needed materials, including benzene hexachloride, toxaphene, DDT, and calcium arsenate were reported from many cotton growing areas during late June and early July.

The cotton leafworm continued to spread rapidly. By July 15 it had been reported from at least 60 counties in Texas, 25 counties in Oklahoma, 8 parishes in Louisiana, and had also reached Jackson County, Arkansas, and Washington County,

(*Turn to Page 70*)

Fungicides Effective in Checking Diseases

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Survey Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

ALTHOUGH tomato fungicide tests at the Florida Sub-Tropical Experiment Station are ordinarily concerned with the control of late blight, this emphasis was changed somewhat during the winter of 1948-49 when gray leaf spot due to *Stemphylium solani* became epidemic in the plots. Thus an opportunity was afforded to obtain information on the effectiveness of certain fungicides for the control of this disease. According to Robert A. Conover, Gray leaf spot was the only important disease present, late blight and early blight appearing only in trace amounts in the checks. The data obtained in the control experiments may be of interest in view of reports that gray leaf spot caused some damage to tomatoes in the middle west during the summer of 1949.

The plots were set out on November 17, 1948, with Grothen Globe tomatoes, each plot being approximately one-hundredth of an acre in area and containing 36 plants. Each treatment was replicated four times in a randomized block design. Fungicides were applied every seven days (total of 11 applications) with a tractor-drawn power sprayer equipped with drop booms. Three nozzles per row were used while the plants were small, the number being gradually increased to nine with increase in plant size. Toxaphene was used as needed to control insects and was applied as a separate blanket spray to all plots. Mature-green tomatoes were picked eight times at weekly intervals beginning January 10, 1949.

The data obtained are presented in Table 1.

It is clear from these data that all fungicides providing zinc ethylene bisdithio-carbamate, with the exception of "Parzate," were outstanding in gray leaf spot control. It should be mentioned that observations made in this and other tests with this lot of "Parzate" indicated it to be substandard. Perhaps this is the reason that the use of this material resulted in a yield reduction out of proportion to the amount of gray leaf spot present. "Phygon," "Copper Compound A," "Copotox," "Parzate," and "CR 305" did not result in commercial control of gray leaf spot in this test.

Powdery Mildew in West

KENNETH F. Baker and Neil A. MacLean, of the University of California, report that powdery mildew, caused by a fungus, *Oidium* sp., hitherto not reported on snapdragon from the western United States, has been found producing economic damage to greenhouse-grown snapdragons in two Pacific Coast States. The disease was noted at Pullman, Washington, in the fall of 1948. In December, 1949 it was found in three greenhouses of the Redwood City area of San Mateo County, California.

The symptoms of the disease were typically those of a powdery mildew, with both leaf surfaces, but predominantly the upper, showing characteristic powdery growth. Some of the older leaves were wilted and necrotic as a result of infection. Stem infections were common on some varieties but not found on others; in many cases they were at the nodes, representing extension by growth of the fungus from leaves and petioles.

All varieties in the Redwood City area were infected, some more severely than others. Observations and grower reports indicated that Peace and Afterglow were severely injured, although they developed few stem infections. Dorcas Jane, Ball's Hybrid White, and Ball's Hybrid Yellow showed severe stem and leaf infection.

Preliminary observations show that this disease can be controlled with sulfur dust under California greenhouse conditions. In eastern greenhouses a wettable sulfur spray (1 to 1½ lb. per 100 gal.), plus a suitable spreader to insure complete coverage, is recommended. This is applied at 7 to 14 day intervals, covering both upper and lower leaf surfaces, from the time seedlings are pricked off until they are 12 to 16 inches high. "Fermate" and "Parzate" are relatively ineffective.

Powdery mildew was first reported in North America in 1936, from Massachusetts. It occurs in other eastern States and in the Midwest. First observation on the Pacific Coast was in 1947, in British Columbia.

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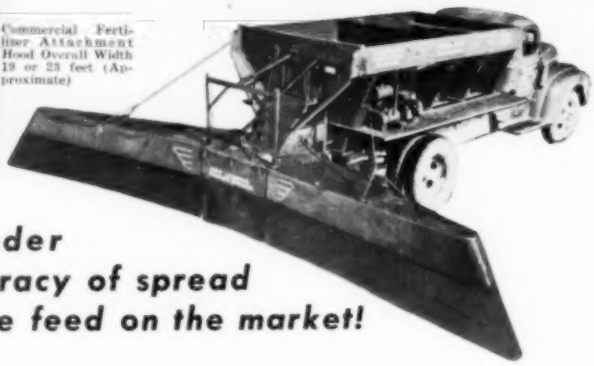

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"The New Leader" Combination Commercial Fertilizer and Lime Spreader equipped *with power take-off*. Note uniformity of material flow along entire width of hood at 10 m.p.h.

Width of spread on this New Jersey farm was about 24-3½ feet. One round trip of an 80-rod field covers 1½ acres. Choice of all-steel or wooden hopper. Sizes 9', 11', 13', and 15'.

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Evidence indicates that powdery mildew is not seed-borne, and it seems probable that shipments of snapdragon plants spread the disease. Florists' snapdragons used to be vegetatively propagated and shipped as cuttings. It is now common practice to plant in greenhouse benches snapdragon seedlings produced by a specialist. Such plants commonly are shipped into California from states in the midwest or east.

It will be of interest to observe whether snapdragon mildew will spread to outdoor commercial and garden plantings in California, particularly to the extensive seed fields of the state.

Flower Blight of Camellia

ALICE J. Watson of the U. S. Bureau of Entomology & Plant Quarantine, studied suspicious material collected during the spring of 1950 by inspectors of that bureau in the course of a survey for the possible occurrence of the camellia flower blight disease in Southeastern States. This disease, originally from Japan, had previously been found in California and Oregon, and in one garden near Atlanta, Georgia.

Of the 150 collections made during the survey, one from Winnabow, North Carolina, and one from Atlanta, Georgia, produced the flower blight fungus, *Sclerotinia Camelliae*, in culture. More than 30 other fungi, some unimportant but many pathogenic, were obtained.

Discovery of the camellia flower blight in Louisiana is reported by A. Plakidas, of Louisiana State University. The blight was first found by C. M. Moss, nursery inspector for the Louisiana State Department of agriculture, in February, on camellia flowers on exhibit at the Shreveport Flower Show. The disease was confined to the flowers of only one exhibitor, a nurseryman from Shreveport. The exhibitor stated that these flowers were not grown in Louisiana, but were imported from California, obviously in violation of the Louisiana State quarantine. All the camellia flowers at the Flower Show were seized and burned, but it was already too late to prevent spread of the disease.

At the beginning of April, two affected blossoms were found on potted plants inside a lath house in a Shreveport private garden. Careful examination of plants growing in the open failed to disclose any sign of the disease. The owner of the garden stated that he had purchased pot-grown plants from California over a period of several years, either directly or through the same Shreveport nurseryman on whose flower exhibit the disease was first found, and that he had observed symptoms similar to those on the diseased specimens in the same lath house last year. Thus it would appear rather certain that the blight had been present in this particular garden for at least one year and probably longer.

Three additional specimens of fallen flowers bearing fruiting bodies typical of the blight fungus have been found since: one in the nursery from which the first specimens came, the others in private gardens. Only a few flowers were found; two of the specimens consisted of one blossom each, the third of three blossoms. The State nursery inspector has made a rather exhaustive inspection of commercial and private plantings in the Shreveport area, examining thousands of fallen flowers and finding only these few specimens with the fungus.

Caddo Parish, in which Shreveport is located, has been placed under quarantine to prevent spread to other parts of the State (assuming that has not already taken place), and a concerted effort will be made to eradicate the disease.

TABLE 1

Incidence of gray leaf spot and yields of mature-green tomatoes from the 1948-1949 fungicide test.

Material and amount used per 100 gallons	Yield, bushels per Acre		
	Gray leaf spot count*	Marketable	Increase over check
1. Dithane Z78 (2 lbs)	2.6	329.8	149.0
2. Dithane D14 (2 quts), $ZnSo_4$ (1 lb), lime (½ lb)	1.5	327.4	146.6
3. Parzate Liquid (2 qts), $ZnSO_4$ (1 lb), lime (½ lb)	2.0	326.5	145.7
4. No. 2 alternated with No. 11	13.2	310.7	129.9
5. CR 305 (2 lbs)	29.2	309.5	128.7
6. Dithane D14 (2 qts), $ZnSO_4$ (1 lb)	1.7	304.4	123.6
7. Magnesium ethylenebisdithiocarbamate (2 qts), $ZnSO_4$ (1 lb)	2.2	302.0	121.2
8. No. 9 first 8 applications, then 3 applications of No. 2	19.2	281.7	100.9
9. Copper Compound A (4 lb)	39.0	274.2	93.4
10. Coptox, (4 lbs)	53.9	269.6	88.8
11. Phygon XL (¾ lb)	28.9	266.2	85.4
12. Parzate (2 lbs)	20.8	265.0	84.2
13. Check	68.3	180.8	—
Least significant difference at odds of 19:1	9.3	58.8	
Least significant difference at odds of 99:1	12.5	70.7	

* Average number of spots per leaflet (6 leaflets per treatment counted)

French Sprayer in U. S.

A new all-purpose sprayer-atomizer manufactured by the French firm Cochica, is being exhibited in the U. S. at the Chicago International Trade Fair. The machine is said to be the first which applies insecticides and fungicides both in the conventional forms and also in mist-dusting and atomized forms. Marketed under the trade name of "Pasteur", it is being distributed in the U. S. by Nomaco, Inc., 20 E. 35th St., New York.

New Washington Address

Blaw-Knox Company has announced a change in the address of its Washington Office from the Munsey Building to Suite 209, Wire Building, 100 Vermont Avenue, N. W., Washington 5, D. C. Marvin Marcus continues as manager.

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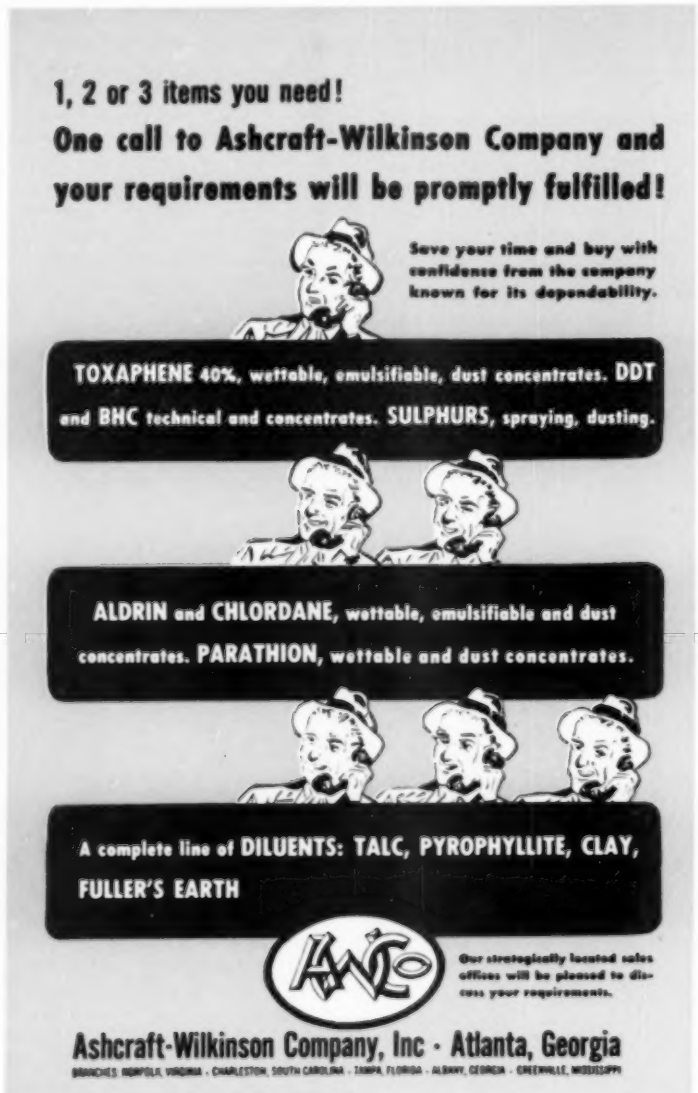
ACS Fertilizer Division to Chicago

THE Division of Fertilizer Chemistry of the American Chemical Society will hold its fall meeting in Chicago, September 4, 5 and 6, according to an announcement by Dr. S. F. Thornton, secretary of the Division. The opening session, with Dr. Vincent Sauchelli, Davison Chemical Corp., Baltimore, as chairman, is scheduled to begin at 2:30 p.m. The advance program for that portion of the meeting is as follows: W. H. MacIntyre, S. H. Winterberg, L. B. Clements, and Brooks Robinson, "Effects of Incorporations of Certain Carriers of Fluorine Upon Its Concentration in Crops and Lysimeter Leachings"; W. H. MacIntyre, S. H. Winterberg, L. B. Clements, L. J. Hardin, and L. S. Jones, "Fluorine Content of Red Clover After Applications of Hydrofluoric Acid on Two Soils"; M. M. Moreland and J. E. Gieseking, "The Influence of Silicate Ions on Potassium Fixation by Clay Minerals"; and Jackson B. Hester, "Fundamental Factors Influencing the Composition of Tomato Puree."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Tuesday morning's program will be presided over by Dr. Thornton, discussing "Calcium Sulfate in Agriculture." This session will begin at 9:30 a. m. with some introductory remarks, and at 10, the first paper will be presented by Walter S. Hamme, "The Story of Gypsum," with Emil Thuog following on "Gypsum: Past, Present, and Future Use as a Fertilizer." Vincent Sauchelli will speak on "Calcium Sulfate in Superphosphate as a Source of Calcium and Sulfur Nutrients," and will conclude the session with a paper on "The Role of Gypsum in the Reclamation and Improvement of Alkali Soils for Agricultural Purposes."

The program continues after the luncheon recess, with Dr. Thornton still presiding. W. H. Colwell will speak on "Calcium Sulfate as a Fertilizer for Peanuts," followed by a paper by J. C. Rinehart, J. C. S. Tedrow, and F. E. Bear, "Gypsum as a Soil Conditioner in Humid Regions."

A. L. Mehring and Gae A. Bennett will present a paper on "Price Relationships of Certain Nitrogen Fertilizer Materials," and G. L. Bridger and J. W. Anderson on "Fertilizer by Hydrolysis and Ammoniation of Cellulosic Materials," to complete the day's activities.

Dr. Sauchelli will be in charge of the final session on Wednesday morning, which completes the program. Scheduled for that time is the following program: E. C. Houston, T. P. Hignett, and R. E. Dunn, "Compound Fertilizers From Rock Phosphate, Nitric and Phosphoric Acids, and Ammonia"; G. L. Bridger and Elmer H. Brunsting, "Acidulation Characteristics of Certain Western Phosphate Rocks"; R. W. Moulton, G. S. Greaves, and P. G. Hebner, "Phosphate Fertilizer by the Fusion of Phosphate Rock and Olivine"; and K. G. Clark and John O. Hardesty, "Observations on the Fertilizer Industry in the United Kingdom, Netherlands and Norway." A business meeting and election of officers will conclude the meeting.

Warfarin to Consumers Now

The warfarin rodenticide (formerly known as "W.A.R.F.-42") has been released for consumer sale, it was announced recently by the University of Wisconsin Alumni Research Foundation, Madison. The new rodent killer, developed by Dr. Karl Paul Link, of the University, is an anticoagulant, killing rats and mice by producing hemorrhage.

Manufacturing rights for the rodenticide are protected by patents owned by the Wisconsin Alumni Research Foundation, and distribut'on is carried out by S. B. Penick & Co., and R. J. Prentiss & Co., Inc., both of New York City.

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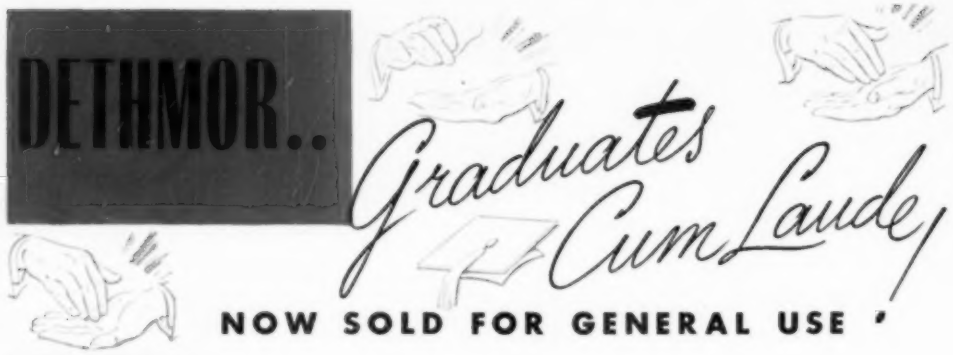

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Technical Briefs

Fertilization Stressed

After-harvest fertilization of berry beds is urged by the Agricultural Extension Service of the University of Arkansas as a means of promoting plant renewal next bearing season. Growers of Arkansas' largest producing commercial berries — strawberries, Youngberries, Lavacaberries, and Boysenberries— are being urged to give special after-harvest care to beds which are to be used again next year in production.

Strawberry growers are advised to fertilize beds immediately after picking. Although some old foliage may be burned by direct fertilizer application, no harm will result, the station reports. Some growers are narrowing strawberry beds to 20 to 24 inches and thinning old mother plants which have become too crowded, before applying fertilizer. Extra doses of nitrogen fertilizer are urged for Youngberries, Boysenberries, and Lavacaberries immediately after pruning, which is recommended as soon as the harvest is over. Nitrogen blends with the soil moisture, moves to the roots, and helps to push out new canes as soon as the older wood is cut off. In some years, use of 100 to 150 pounds of nitrate of soda per acre may make the difference between a poor crop and a full crop of high quality fruit.

Sprayed Nutrition?

Results of investigations at the New York State experiment station at Geneva to determine how well foliage sprays are able to supply nutrition to vegetable canning crops are reported in the July issue of *Farm Research*, published by the Geneva station. Experiments were made through applying to foliage, sprays containing essential elements for plant growth.

During the past winter, Red Jacket tomatoes and Detroit Dark Red beets were grown in sand cultures in the greenhouse at different nitrogen levels—very low, low, medium, and very high (milli-equivalents of N per liter 0.18, 1.8, 18, and 36, respectively). The plants received the same amount of the necessary elements except nitrogen by flooding the sand three times daily at the start and four times daily later.

A series on the lowest level of nitrogen received urea sprays twice a week, beginning at 4, 6, 8, and 10 weeks after transplanting. A comparable series was established in which the nitrogen in the solution was raised from the low to the medium level, starting at the 4-, 6-, 8-, and 10-week periods.

Preliminary results indicate that although the tomatoes could stand a slightly higher nitrogen content in the solution than the beets, the beets could tolerate a more concentrated nitrogen spray. The plants showed a moderately better growth as a result of the nitrogen sprays. However, all the plants getting the additional nitrogen through the roots were far superior in size, color, and set of fruit to any receiving it through the leaves, regardless of when the supplementary nitrogen was added.

Indications at present are that applying fertilizers to the soil still remains the best method for feeding vegetable canning crops. Nutritional sprays are best used as emergency treatments for overcoming acute deficiency symptoms.

Controlling Spruce Budworm in Big Areas

DURING June and July of this year Federal, state and private agencies have been waging a war against the spruce budworm in the Douglas fir and white fir forests of Oregon and Washington. Fleets of airplanes have been busily shuttling back and forth over heavily infested timber while dispensing insecticide at the rate of a pound of DDT in a gallon of oil, per acre. In magnitude, this insect control operation surpasses anything of a similar nature heretofore undertaken.

For several years now evidence has been accumulating that the spruce budworm was on the upswing in the Northwest. As early as 1948 the situation had developed to the point that the Federal government and the State of Oregon conducted experiments to determine whether the insect would be controlled in forested areas with DDT sprays liberated from airplanes. These tests (in which a pound of DDT in oil solution per acre was applied) were so successful that a large scale control program was undertaken in 1949. Again, results on approximately a quarter of a million acres were so encouraging that this project formed the basis for the 1950 program.

The 1950 control program is a graphic illustration of the value of advanced planning and of the results that may be obtained when all agencies interested in a program of this kind pool their knowledge and efforts in a cooperative undertaking. Federal, state and private agencies all recognized the danger to the valuable fir stands in the northwest by the unrestricted feeding of the budworm. As a result, in 1949 all of these groups worked hand in hand to survey the fir stands of the region to determine the extent of the infestation, and the areas immediately in greatest danger of complete defoliation and death. These efforts disclosed that the budworm was present on 2,267,000 acres and that heavy infestations were present on 887,000 acres.

Once the results of this survey became known, representatives of these agencies met in a series of conferences and drew up a proposed program of control for 1950. As finally adopted, this plan called for the spraying of 905,000 acres of infested timber with a pound of DDT in a gallon of oil per acre. Of this acreage the Federal government had the responsibility of spraying 560,000 acres, an area equivalent to that occupied by Federal land. The states of

Oregon and Washington were responsible for the remainder. In the interest of economy and efficiency, the plan called for the State of Oregon to spray lands of all ownerships in certain areas, and for the Federal government to do all the work in the remaining ones regardless of ownership. The project was financed cooperatively, contributions being made by all interested agencies, including timberland owners. The Forest Service was directly in charge of all Federal work, and the Bureau of Entomology and Plant Quarantine technically supervised the work on all lands, regardless of ownership.

This insect control program was a big undertaking and the fact that it has proceeded largely according to plan is a tribute to the organizations and individuals involved. The fact that the habits of the budworm are such that the control program had to be carried through in a very short time did not make the job any easier. Flight conditions over such a large area were not always ideal, especially during the few hours of the day when it is possible to apply aerial sprays satisfactorily.

It is still too early to report on the over-all effectiveness of the work done this season. The sprayed areas are large, and further time is necessary before the final results are known. However, from preliminary reports on certain of the areas sprayed early in the season, it appears that the degree of control may be expected to approximate that of last year when 97 percent of the budworms in the sprayed areas were destroyed.

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Brush Control Reviewed

Control of brush by chemical applications, is no longer in the experimental stage, but is now an established practice. The use of 2,4,5-T has increased in importance in comparison to 2,4-D, but each has specific applications and combinations of the two are useful for control of numerous weed pests. Stump treatments have proved more successful, with 2,4,5-T than with 2,4-D. In foliage applications for control of mixed brush species, a mixture of 2,4-D and 2,4,5-T esters using not less than 50% 2,4,5-T seems logical. For solid stands of a single specie resistant to 2,4-D but susceptible to 2,4,5-T, it is suggested that only 2,4,5-T be used and vice versa.

For foliage spraying, high volume water sprays using ester formulations seem to be favored over low volume oil sprays. Airplane application of 2,4-D and 2,4,5-T in oil has given good results on certain range species.

Dormant brush control, either treating the entire plants or only the basal portions of plants, shows extremely promising possibilities. Use of 2,4,5-T is apparently more effective than 2,4-D for dormant treatment.

In all cases, the proper application of sufficient amounts of chemical is of primary importance. It is better to put on too much than too little, in both foliage and dormant treatment. Oil seems to be the best carrier for dormant treatments, although emulsions with or without added oil have possibilities.

Delayed response to dormant treatment should be expected and trees may not die until late in the following summer. Indications are that one dormant application may be just as effective as one foliage treatment.

———*Summary of talk given by Lawrence Southwick, Dow Chemical Co., at Southern Weed Control Conference, Biloxi, Mississippi, Feb. 1950.*

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Describes 'Hopper Control

"Grasshopper Control with Chemical Sprays and Dusts" has been published by the Oklahoma Experiment Station, Stillwater, Okla., as bulletin B-351. Materials tested included DDT, BHC, chlordane, toxaphene, parathion, aldrin and dieldrin. Insecticides giving most effective control as sprays are listed as chlordane, 1 to 1.5 pounds per acre; toxaphene, 1.5 to 2.0 pounds per acre; and parathion, 0.2 to 0.3 pound per acre. Most effective control the booklet reports, was obtained by spraying these materials on succulent plants during May when the nymphs were nearly all hatched and were feeding. As the season progresses, costs increase and control decreases, it points out.

BHC, it states, is most satisfactory when applied as a dust at the rate of 0.5 to 0.6 pound of gamma isomers per acre. Compared with other materials, it is especially useful later in the season when temperatures are high and most grasshoppers have reached the adult stage. Aldrin and dieldrin showed promise, but as in the case of parathion, the materials are too toxic to warm-blooded animals for general recommendation.

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Tests on Resistant Flies

Studies on the control of house flies (*Musca domestica L.*) in dairy barns with residual treatments of various insecticides were conducted in the vicinity of Miami and Orlando, Fla., during 1949. Tests were also made at Orlando to determine the effectiveness of several insecticides as space sprays in dairy barns. The resistance of flies from different dairy barns to these insecticides was determined in laboratory tests.

Chlordane emulsion at 100 mg. of toxicant per square foot was the most consistently effective treatment, showing 84 to 98 percent control for 5 to 7 weeks or longer in all barns. DDT failed to give appreciable control in two of three barns. A mixture of chlordane and DDT was less effective than chlordane alone but was more effective than DDT alone. Methoxychlor and a mixture of DDT and methoxychlor were effective in some cases, but not in others. A 50 mg. dosage of lindane gave excellent control in three of four tests and was somewhat more effective than a 25 mg. dosage. Dieldrin gave excellent control of flies in most tests at dosages of 50, 25, and 10 mg. per square foot. Toxaphene at 200 mg. per square foot was highly effective as an emulsion, but was less effective in a wettable-powder spray.

Treatments with 5 mg. of pyrethrins plus 50 mg. of piperonyl butoxide were relatively ineffective, and twice this dosage gave only fair control for 1 week.

Preliminary tests indicated that good control of house flies in dairy barns can be obtained by frequent space spraying with lindane, dieldrin, or pyrethrum plus piperonyl butoxide.

(*Turn to Page* 71)

Suppliers' Bulletins

Blending Machine Folder

A. E. Poulsen & Co., Los Angeles, have prepared a descriptive folder on their "R.T.R. Uni-Blender" which the makers state is ready to start operation 48 hours after arrival at the purchaser's plant. The machine is pre-assembled, will fit under a 13-ft. ceiling, and requires no special foundation for installation. Write A. E. Poulsen & Co., Dept. 3, 2025 San Fernando Rd., Los Angeles 65, Calif.

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Offers Fumigant Information

"How To Do Soil Fumigation with 'Larvacide'," (chlorpicrin fumigant) is the title of a six page, two color brochure just released by the Insecticide Division of Innis, Speiden & Co., 117 Liberty Street, New York 6, N. Y.

Included in the brochure are techniques for using "Larvacide" against damping-off, wilts, root rots and weed seeds. Easy methods are outlined for using the tear gas fumigant for control of nematodes (eelworms) and other insects found in the upper 12 inches of soil.

Included also are sections on treatment of compost or bulk soil and the treatment of mushroom casing soil. Seven steps in application comprise the section on directions. Application equipment is illustrated, and a table of amounts to use shows how economical Larvacide can be. The brochure is available upon writing to the company.

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Pest Control Bulletin

An informative bulletin on "Pest and Disease Control in the Home Garden" has been issued recently by the Extension Service of the Institute of Agricultural Sciences, Washington State College, Pullman, Wash. The bulletin, (No. 430) lists the various pesticides used against insects and plant diseases, gives a brief decription of each with recommended dosages for certain pests and warnings against use hazards.

A "Pest and Disease Control Chart" is presented with data covering the crop name, the pest (or disease) to be controlled, and a description of injury and control to be expected through the use of various toxicants.

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Respirator Information

Pulmosan Safety Equipment Corp., offer descriptive bulletins on their two respirator models, "DC-6100" and "DC-6500", for protection against dusts, vapors and mists of parathion. The makers claim that the equipment is safe, compact, and easy-breathing, and is easily-cleaned. Write Pulmosan Safety Equipment Corp., 644 Pacific St., Brooklyn 17, N. Y., or, 1831 Franklin Ave., St. Louis, Mo.

•

Plastic Tubing Folder

U. S. Stoneware, Akron, Ohio, has issued a recent bulletin describing its line of Tygon Plastic Tubing, its uses, properties and chemical resistant characteristics. Complete tables showing resistance of the tubing to various compounds and combinations are given, along with photographs and other illustrative material. Copies are available from the company Box 350, Akron 9, Ohio.

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Testing Information Out

Dr. G. R. Townsend, Belle Glade, Fla., has issued a booklet describing facilities for field testing fungicides, insecticides, seed treatments, soil treatments, herbicides and nematocides. Information is given concerning the starting time for testing various crops, and the number of days which the various tests require. Write for booklet "Florida Field Trials," c/o Dr. G. R. Townsend, Box 356, Belle Glade, Fla.

•

Offers New Carloader

Sprout, Waldron & Co., Muncy, Pa., have published a new bulletin illustrating the company's model 200 carloader for use in handling bulk fertilizers and other chemicals. The device operates through an air flow which distributes the material to the right and left at the same time, thus filling a car at each end simultaneously. The machine is available in two styles: a permanent inside installation, and a portable job to facilitate reloading from truck to railway car. Write for bulletin 27, in care of the company.

•

Hand-Spray Nozzle Data

Spraying Systems Co. has offered data sheets 4670 and 4675 describing its "Trigger Teejet" nozzle for hand spraying. This piece of equipment features a drop forged brass valve body with stainless steel valve stem and self-seal packing, the company states. Write Spraying Systems Co., 3230 Randolph St., Bellwood, Ill.

•

Chlordane Bulletin Out

Velsicol Corporation, Chicago, has issued bulletin No. 37 entitled "Chlordane for the control of onion insect pests," which describes recommended procedure for control of onion maggot and onion thrips. The pamphlets are available from the company, 330 E. Grand Ave., Chicago 11, Ill.

•

U.S.I. Grain Protectants

U. S. Industrial Chemicals, Inc., New York, has announced the development of a new type of treatment for the protection of stored wheat and other grains. The products, known as "Pyrenone Wheat Protectant" and "Pyrenone Grain Protectant," are mixed with the grain to eliminate hidden infestation, which is largely the cause of insect fragments in flour and other grain meals. Rate of application is 100 pounds per 1,000 bushels, or about 1.6 ounces per bushel. This rate is calculated to cost the farmer about 2c per bushel.

The makers state that in both materials, "Pyrenone," a combination of piperonyl butoxide and pyrethrins, is mixed with or impregnates a carrier which in turn adheres to grain kernels to provide the protection. These materials are said to be completely free of toxic hazards, which makes possible their use in this manner for

(*Turn to Page 71*)

THESE GRANULES PROVIDE CONTROL

Only Davison uses an exclusive finishing process that produces superphosphate in granules. Davco Granulated Superphosphate thus offers you a number of sales points that you can use to make your business grow.

1. *Davco Granulated Superphosphate stores without caking, in your warehouse, in the farmer's barn. That's storage control.*

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Davison is a primary producer of superphosphates, mining its own phosphate rock, producing its own acid, scientifically controlling every step of the process. Thus, you get quick delivery of the highest quality, either bulk or bagged. Price puts you in a favorable competitive position.

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INDUSTRY NEWS

Culpepper Named Vice-Pres

James H. Culpepper, Jr., has been named vice-president of the Smith-Douglass Company, Norfolk, Va., according to an announcement

JAMES H. CULPEPPER, JR.

by Ralph B. Douglass, president. The new officer has been with the company since 1938, and before his latest advancement, was assistant sales manager at the company's general office. He was previously connected with the firm's Kingston, N. C. branch.

Mr. Culpepper is a native of Norfolk and a graduate of Virginia Military Insitute. During World War II, he served as a major in U. S. military intelligence for three years (1943-1946).

•

States Committee Viewpoint

Representative James J. Delaney, (dem., New York), chairman of the seven man Select Committee named by Speaker of the House Sam Rayburn to investigate the toxic effect of various chemicals used in the production of foodstuffs, has made a statement outlining the objectives of the Committee's work. The statement follows:

The Food and Drug Administration reports there are more than 700 chemical substances used or proposed for use in foodstuffs. Most of these have been developed since the war. The law does not require advance proof of safety in the use of these products.

The great increase in the number of these products and their widespread use have made it most difficult for government food experts to keep a thorough watch on their field. The Food and Drug Administration has made many requests and recommendations for regulations to protect the public health from possible toxic effects from use of chemical compounds in food.

In studying this problem, the Select Committee will have in mind the recommendation of Dr. Paul B. Dunbar, head of the Food and Drug Administration, that Congress enact a law requiring affirmative proof by promoters of new chemical substances that their product is safe for human consumption. Such advance assurance is required now in the case of new drugs.

Dr. Dunbar has also requested our subpoena to gather the most comprehensive information in carrying out tests for safe use of chemical compounds in foodstuffs and insecticides. This request will be carefully studied by the Committee.

Most large producers in the food industry have done a commendable job in supplying us with wholesome food for which America is justly famous. Before using the new chemical compounds, these producers have made extensive and thorough tests to make sure the new substance could be used with complete safety to the consumer.

What we are seeking is information on all chemical substances used in processing and manufacturing foodstuffs, about the content of insecticides and pesticides and chemical fertilizers and their effect on the human system. We want to determine if the chemical substances used in any of these three fields have residual toxic effects on the human system, on animals, or on foodstuffs derived from animals.

•

To Become Coll. of Agri.

That the Riverside (California) Agricultural Experiment Station is to be converted into a University of California College of Agriculture, has been announced by the University. The Station is shortly to undergo an extensive building program in preparation for its new role.

•

Fertilizer Man Dies

John W. Murray, Sr., 76 retired superintendent of the Armour Fertilizer Works, Columbus, Ga., died July 7, 1950. He had been employed by Armour for a number of years before his retirement in 1939, and had been a resident of Columbus for 35 years.

Spencer Advances Taylor

Spencer Chemical Co., Kansas City, Mo., has announced that George V. Taylor has been put in charge of the company's advertising, agronomy

GEORGE V. TAYLOR

and market research activities. Mr. Taylor has been with Spencer since 1942, and since 1947 has been director of market research for Spencer.

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Organize Fertilizer Group

A new organization to investigate and improve present fertilizer manufacturing processes and to develop new products for the industry, has been formed under the name of Stagson Research Corp. Offices and laboratories of the corporation are at Charleston, S. Carolina.

The new organization was formed by Smith-Douglass Co., Norfolk, Va., Naco Fertilizer Co., New York; Acme Fertilizer Co., Wilmington N. C.; Southern Fertilizer & Chemical Company, Savannah, Ga.; Gulf Fertilizer Company, Tampa, Fla., and I. P. Thomas & Son Company, Camden, N. J.

Officers of the new company are president, R. R. Hull, president of I. P. Thomas & Son; vice-president, Omar Sandards, vice-president of Fertilizer Industries, Inc., New York, and secretary-treasurer, F. H. Lavery, secretary-treasurer of Fertilizer In-

SULPHUR

*Interesting Facts Concerning This Basic Raw Material from the Gulf Coast Region

*MAN MADE MOUNTAINS

Sulphur from the field collecting stations is delivered to the vats through insulated pipe lines which discharge directly on the vats. The sulphur is pumped at such a rate that the height of the vat is increased only a few inches per day, the slight vertical rise being the result of a large horizontal area which provides maximum cooling surface and ample tonnage capacity. As the sulphur solidifies it gradually builds up into a great block or vat of solid sulphur, which may be as large as 1200 feet long, 50 feet high, and 200 feet wide, and containing as much as half a million tons of sulphur.

The discharge lines are placed so that the liquid sulphur is spread in an even layer over the entire surface of the vat and is permitted to solidify uniformly. If the liquid sulphur is introduced too rapidly or is not properly distributed, pockets of liquid sulphur will be covered by a crust and remain in the solid sulphur. The low heat-conductivity of sulphur might keep such pockets liquid for a year or more.

Loading operations at one of the huge vats of Sulphur at our Newgulf, Texas mine. Such mountains of Sulphur are constantly being built at our mines, from which shipments are continually made.

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Mines: Newgulf and Moss Bluff, Texas

dustries. Frank A. Wilson, former Charleston manager of Virginia-Carolina Chemical Company, has been appointed director of research and development.

•

C. S. C. to Build New N Plant

Commercial Solvents Corporation will construct a million-dollar addition to its ammonia plant at Sterlington, La. to produce nitrogen solutions, according to an announcement by J. Albert Woods, C. S .C. president.

The new unit will be located on the present Sterlington plant site which makes anhydrous ammonia from natural gas. It is expected to be in operation early in 1951. The Sterlington plant, constructed for the government during the war by Commercial Solvents, was purchased by the company in 1946, for six million dollars. A large amount of the anhydrous ammonia production is being used for direct application to the soil, principally in Louisiana and Mississippi. In commenting on the expansion program, Mr. Woods states that "The production of nitrogen solutions will broaden Commercial Solvent's base in this field and place the company in a better position to serve the fertilizer industry.

•

Advanced by Innis, Speiden

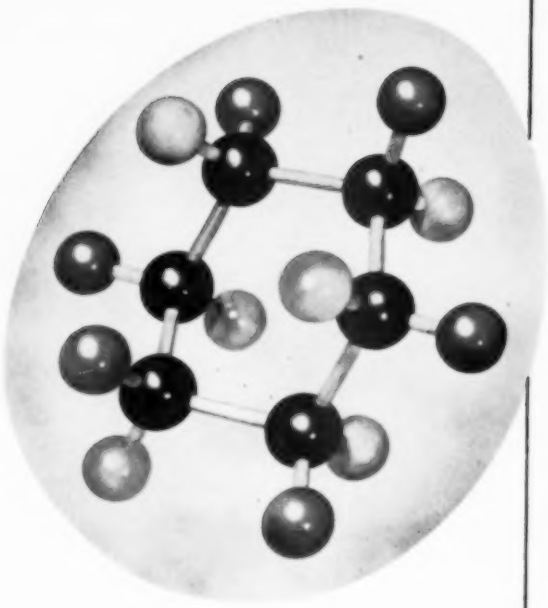
Donald S. Cushman (above), was recently appointed vice-president in charge of sales for Innis, Speiden & Co., New York. He was previously assistant to the president, and has been with the firm since 1928.

Touring the CSC plant at Sterlington prior to the decision to build the new nitrogen solutions plant, are (left to right) J. Albert Woods, president; M. C. Wheeler, vice president in charge of production, A. K. Hamilton, vice presiednt; and J. E. Wheeler, plant manager.

Weed, Hormone Articles

The "Dow Diamond" for June, 1950, caries two articles of interest to persons in the agricultural chemical field. One is a report of weed control activities by the Lackawanna Railroad which has been using chemical methods of weed eradication instead of manual means. First applications were made in 1947, with "Estron 44" brush killer, with good results on the small scale that the tests were run that year. Next year, with improved spraying equipment, a 60 percent kill of brush was achieved on 602 miles of track. By 1949, the railroad had built an improved spray car which applied a mixture, in equal parts, of the isopropyl esters of 2, 4-D and 2, 4, 5-T emulsified in water. That year, 742 miles were sprayed, with a kill of 75 to 85 percent. For 1950, the railroad expects to treat 1,600 miles of right-of-way.

The Diamond also presents a feature on the use of chemical growth regulator on tomatoes, with photos illustrating the application of the p-chlorophenoxyacetic acid product on plants. It is marketed by Dow under the trade name of "Sure-Set."



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SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH

Del-Mar-Va Peninsula Fertilizer Group Meets at Ocean City, Md.

Here is the group attending the Del-Mar-Va Peninsula Fertilizer Association meeting in June, at Ocean City, Md. Governor Elbert N. Carvel of Delaware (fifth from right in front row) is president of the Association which held its 26th annual meeting at the Maryland resort recently. (Report in July Agricultural Chemicals).

Congress Pesticide Comm.

Members of the seven-man Congressional committee authorized under the Sabath Resolution (HR 323) to investigate the use of pesticides in agriculture, have been selected by House Speaker Sam Rayburn. Chairman of the committee is James J. Delaney, New York. Other members are Thomas G. Abernethy, Mississippi; E. H. Hedrick, West Virginia; Paul C. Jones, Missouri; Frank B. Keefe, Wisconsin; A. L. Miller, Nebraska; and Gordon L. McDonough, California.

The committee is to "direct and conduct a full and complete investigation and study of the use of various chemicals and compounds in the production, processing, preparation and packaging of food products." The committee's work is to consist of three phases, one of which is to be insecticides and related materials.

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APS Group Names Blodgett

Earle C. Blodgett, Prosser, Washington, was elected president of the Pacific Division of the American Phytopathological Society at the group's meeting in Salt Lake City in June. Mr. Blodgett succeeds William C. Snyder, Berkeley, Calif. Other officers named at the meeting included W. B. Hewitt, University of California, Davis, vice-president; and George A. Zentmyer, University of California, Riverside, re-elected secretary-treasurer.

Approximately a hundred persons attended the sessions, with representatives present from Arizona, British Columbia, California, Colorado, Delaware, Hawaii, Idaho, Maine, Maryland, Massachusetts, Missouri, Montana, Nevada, Oregon, Washington and Utah.

As indicated in the program published in June *Agricultural Chemicals*, the group visited the American Smelting and Refining Company laboratories and the Utah State Agricultural Experiment Station; and heard prepared papers on a wide variety of plant pathological topics.

MEETINGS

National Pest Control Association, Netherland-Plaza Hotel, Cincinnati, Ohio, October 22-25.

National Shade Tree Conference, Syracuse, N. Y., Aug. 21-25.

National Agricultural Chemicals Association, Essex & Sussex Hotel, Spring Lake, N. J., September 6, 7 & 8.

California Fertilizer Association, Coronado Hotel, San Diego, Calif., November 2-4.

N. Y. State Insecticide & Fungicide Conference, Ithaca, N. Y., November, 14-16.

American Phytopathological Society Peabody Hotel, Memphis, Tenn., Dec. 1, 2, 3, 1950.

North Central Weed Control Conference, Milwaukee, Wisconsin, December 12-14.

American Association of Economic Entomologists, Denver, Colorado, Dec. 18-21.

Davison Advances Gayle

Joseph Gayle, Franklin, Indiana, has been made manager of The Davison Chemical Corporation's fertilizer plant, at New Albany, Indiana, to succeed J. C. Hoglen, who resigned recently, the company has announced. Mr. Gayle has been field representative for Davison in central Indiana for about 19 years. His advancement, the announcement said, is in line with Davison's policy to recognize loyal successful service among its own employees. Mr. Gayle has served in the fertilizer industry in a number of capacities, following his graduation from the College of Agriculture of the University of Kentucky and his teaching agronomy at both Ohio State and Purdue Universities.

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New Chemical by Stauffer

Stauffer Chemical Company has announced the availability of ethylene trithiocarbonate, a bright yellow to brown crystalline solid. For agricultural use, there are indications that the material may be used as an aphicide and scalicide, and perhaps as an intermediate in the manufacture of economic poisons. Among other uses, it is suggested as an intermediate in the manufacture of organic chemicals, and as a sulfur solvent. Inquiries for samples, further data, etc. are invited at the company's New York offices at 420 Lexington Avenue.

SERVICE TO MANKIND

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F. S. WASHBURN
Director, Agricultural Chemicals Division, American Cyanamid Co., New York.
BYRON P. WEBSTER
Vice-President, Chipman Chemical Company, Inc., Bound Brook, N. J.

President Truman, in his address before the Annual Convention of the American Newspaper Guild, in Washington, June 28, called attention to the tremendous improvement in health and increased crop production, resulting from the use of insecticides.

In the President's words:

> *"In northern India, there is a very rich farming area known as the Terai district. In recent years, the malaria mosquito forced people to leave this land. One hundred and four villages were abandoned. . . India called on the World Health Organization for help. . . In the face of great difficulties, this international group sprayed the area with DDT. Today, a year later, no infected mosquito is to be found in any village in the Terai district.*
>
> *"Four years ago, the Government of Iran asked the Foundation to set up a demonstration project in a group of 35 villages not far from the capital at Tehran . . . The Foundation met a water shortage by drilling deep wells . . . It sprayed homes with DDT . . . It sprayed crops with insecticides. Today, only four years later, the village people are at work in new carpentry shops, vegetable gardens, and orchards. And, most startling of all, the yield of grain in this area has tripled."*

National Agricultural Chemicals Association

Barr Bldg., 910 17th St., N.W. Washington 6, D. C.

OFFICERS

ERNEST HART, *President*
A. W. MOHR, *Vice-President*
LEA S. HITCHNER, *Executive Secretary and Treasurer*

Copper in Tobacco Yield

Three years of experiments with copper sulfate applied to Havana seed tobacco at an acre rate of 18 to 20 pounds gave an increase of 13 to more than 26 per cent in crop value.

Total copper added to the soil may be detected by spectrographical analyses. Active copper, also best determined spectrographically, does not increase to any great extent through copper sulfate application to the land.

No *absorbable* copper was formed, since Cu-content in leaf tissue of tobacco grown *with* copper sulfate was less than in leaves grown on land where no copper sulfate was added.

Nitrification appeared to be stimulated within the range of 18 to 27 pounds of copper sulfate per acre.

The fire-holding capacity (burn) of tobacco was not in the least retarded through the use of copper sulfate: neither were the potash and the chief mineral constituents of the tobacco leaf altered as compared with tobacco from check plots.

The addition of copper sulfate to tobacco land at the rate of 20 pounds to the acre seems advisable, but growers are cautioned to check occasionally the status of active copper in the soil.

—From *Bulletin* 535, Connecticut Agri. Exp. Station, New Haven, Conn. Extra copies of full text available from Conn. Station; Battelle Memorial Institute, Columbus, Ohio; or from Phelps-Dodge Refining Corp., 40 Wall St., New York 5, N. Y.

•

Pennsalt Expands BHC 45%

Pennsylvania Salt Manufacturing Co. is expanding its benzene hexachloride production by approximately 45 percent at its plant at Natrona, near Pittsburgh, it has been announced George B. Beitzel, Pennsalt president. Work on the new facilities has been started, he said, and the increased production will be available by the end of 1950. This will be devoted entirely to the production of technical BHC, containing 36 percent gamma isomer. Field experience during the past four seasons has indicated this to be the most practical basic material for the uses developed for the insecticide.

This product is sold under the trade name of "Penco BHC Technical 36" to other insecticide formulators and is used as the basic material in Pennsalt's "Penco" line of BHC insecticides. These include wettable and dust base products containing 12 percent gamma isomer, an emulsion concentrate containing 11 percent, combinations of BHC and DDT for cotton insects and several other special formulations for cotton insects, some of which are formulated at the company's Bryan, Texas, plant.

Pennsalt, one of the pioneers in developing this insecticide, began an extensive research program on BHC in 1944. Field tests were conducted in 1945 and the following year limited quantities of the high gamma isomer BHC were first made available from pilot plant production. The company began full-scale production in 1947.

In all, appropriations of more than a million dollars have been made for other expansion and improvements by the company at existing plants at Wyandotte, Mich.; Calvert City, Ky.; and Natrona and Cornwells Hts., Pa.

•

Name Anniversary Speaker

The Connecticut Agricultural Experiment Station, oldest in the U. S., will observe its seventy-fifth anniversary officially on September 28 and 29, it has been announced by the New Haven institution. Dr. Detlev Wulf Bronk, president of Johns Hopkins University, Baltimore, is to deliver the main address on the evening of September 28.

Dr. Bronk has been president of Johns Hopkins since January 1, 1949, and was recently elected president of the National Academy of Sciences for a four-year term. He is also chairman of the National Research Council and holds numerous other directorships and honorary positions.

•

TV for Iowa State

Iowa State College, Ames, is making use of television for demonstrating proper farm practice. The programs are broadcast from the college's station WOI-TV, which has the distinction to be the nation's first educational television station. Operations are unique in that the station is operated exclusively by film or substitutes such as slides or charts. Yet a program schedule of nearly 15 hours a week is maintained, including some of the top television programs.

But on the practical side, the station makes good use of the college visual instruction service library of film. It produces local live shows on film which have had good acceptance.

Iowa State's extension specialists find in the medium an opportunity to use the visual aids and demonstration techniques with very little change from their farm-and-home meeting methods. The agronomist may demonstrate the imporance of organic matter in the soil; entomologists may demonstrate proper control methods, and others also find the medium to be useful.—from *Agricultural Leaders' Digest.*

•

Atomic Research by USDA

A $250,000 specially-designed greenhouse has been erected at the Beltsville, Md. research center of the U. S. Department of Agriculture, for research in plants and soils with radioactive isotopes. The greenhouse, guarded behind a seven-foot high fence, is a project sponsored jointly by the U.S.D.A. and the Atomic Energy Commission.

The launching of this work is regarded one of the most important peacetime projects of the AEC. It is expected that the research with radioactive materials will reveal new and valuable information on many fundamental aspects of soils and plant nutrition.

Studies with radioactive phosphorus already have shown how different plants make use of this element in different soils. These investigations have been under way in Federal and State experimental stations for three years and the fertilizer industry has been cooperating in this work. The work at Beltsville will now be enlarged to include calcium, zinc and sulfur radioisotopes, with other studies to come later.

Bondy, Entomologist, Dies

Floyd F. Bondy, U.S.D.A. entomologist who for the past 33 years had conducted research on insect pests attacking cotton, died July 19 at Florence, S. C. Mr. Bondy was an expert on many cotton insects, particularly the boll weevil and the cotton aphid. From 1917 to 1928 he was stationed at the Department's cotton insect field laboratory at Tallulah, La., and had since been in charge of the cotton insect research program of the Bureau of Entomology and Plant Quarantine at Florence. He was a native of Louisiana, and held a B.S. degree from Louisiana State University where he specialized in entomology.

•

Resistant Weeds Next?

Preliminary results with 2, 4-D on the second generation of Johnson grass have indicated that such weeds growing from seeds taken from plants which survived application of the herbicide the previous year, show a definite resistance to the material. Leo Herbert, weed specialist with the U.S.D.A. Bureau of Plant Industry, Soils and Agricultural Engineering at Houma, La. reports that the weed is twice as resistant to the action of the herbicide after the first generation of plants had been destroyed.

Specifically, the tests indicated that as much as 95 percent of the Johnson grass in a field of sugar cane would be killed by 2, 4-D. The sugar cane would be undamaged, but seeds saved from the surviving Johnson grass plants produced weeds which required two times as much toxicant to kill. Futher studies are under way, and it is emphasized that the results so far obtained are of preliminary nature.

•

M.I.F.I. Names Culver

At a recent meeting of the Board of Directors of the Michigan Insecticide Fungicide Institute, S. J. Culver, 905 W. Washington, Jackson, Michigan, was employed as executive secretary. Mr. Culver took over the duties as secretary beginning July 1st. He will also act in the capacity of assistant treasurer for the time being. All future communications for the Michigan Insecticide Fungicide Instituteshould be directed to Mr. Culver, the group has announced.

•

Dimond Named Dept. Chief

Dr. Albert E. Dimond has been named chief of the Plant Pathology Department at the Connecticut Agricultural Experiment Station, New Haven, succeeding Dr. James G. Horsfall, director of the Station. He has been assistant chief of his department since April, 1949.

Dr. Dimond is a well-known authority on the chemotherapy of plant ailments, a method of treating plants internally for the control of disease. He has done much of the original work in this field and is considered one of the leading scientists in the nation in this line of research. One of his best known current projects concerns Dutch elm disease.

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L. M. Joshel Hyman Treas.

At a recent meeting of the board of directors of Julius Hyman & Company, Denver, Colorado, Dr. Lloyd M. Joshel was named treasurer

DR. LLOYD M. JOSHEL

of the company. He has been purchasing agent of the company since it was organized in 1946, and was with the War Production Board in Washington, D. C. previously. The Hyman Company is presently producing and marketing aldrin and dieldrin.

•

"Warfarin Name Chosen

The coined generic name, "Warfarin", has been adopted by various agencies for designating the anticoagulant chemical 3(-acetonylbenzyl)-4-hydroxycoumarin, previously known as "Compound 42" and "W.A.R.F.-42." As has been the case in the selection of generic names for insecticides and fungicides, "warfarin" has been named through the cooperative consideration of several agencies, interested groups, and the industry which will produce the material.

The announcement of the selection was made June 29, by S. A. Rohwer, chairman of the interdepartmental committee on pest control. Dr. Rohwer, assistant chief of the U.S.D.A. Bureau of Entomology and Plant Quarantine, states that "warfarin" has been recorded in the search files of of the Trade Mark unit of the U. S. Patent Office, and that notice of the adoption of the name has been sent to interested groups in countries such as Belgium, Canada, Denmark, England and Holland. The term is a common name, Dr. Rohwer reminds, and should be used with the first letter uncapitalized except when capitalization is in keeping with accepted usage for common names.

Participating in the selection of the name were the following agencies and organizations: *Chemical Abstracts*, of the American Chemical Society; the Committee on Pesticides of the American Medical Association; Insecticide Division of the Production and Marketing Administration; Division of Pharmacology, Food and Drug Administration; Fish and Wildlife Service, Department of the Interior; Preventive Medicine Division of the Office of the Surgeon General, Department of the Army; Bureau of Medicine and Surgery, Department of the Navy; Technical Development Services, Communicable Disease Center, U. S. Public Health Service; and members of the Interdepartmental Committee on Pest Control representing other units of the Federal Government. Communications received from various agencies interested in rodenticides indicate that they will use the name in publications issued by their offices. It is understood that the name may be used in connection with the labeling of rodenticides containing the chemical, which are marketed in compliance with the Federal Insecticide, Fungicide, and Rodenticide Act.

•

Toxaphene Information

"A Digest of Information on Toxaphene" is the title of a U.S.D.A. Bulletin (E-802) by R. C. Roark of the Division of Insecticide Investigations. As the title suggests, the 85 page brochure is a compendium of brief statements reporting action of the material on a wide variety of insects. Also included in the processed booklet is a summary of the material's chemistry, its analysis, and formulations in the forms of solutions, dusts, wettable powders and emulsions. The compatibility of toxaphene with common spray materials is discussed, as well its phytotoxicity and its effects on animals. Insects on which there are reports concerning toxaphene are classified according to the order, family and genus of each species.

Sloman Named by Davison

Russell Sloman succeeded Thomas Hoshall, on July 1, as manager of The Davison Chemical Corporation fertilizer plant at Perry,

RUSSELL SLOMAN

Iowa, according to an announcement of K. D. Morrison, vice president of Davison. Mr. Hoshall has resigned to accept a similar position in Omaha, Neb. Mr. Sloman, a graduate of the University of Illinois, where he specialized in agriculture, has been employed since 1935 by Davison's Columbus, Ohio Fertilizer Division, in sales and agricultural development services in Ohio, Indiana, and Michigan.

•

N.S.D.A. Elects Officers

The National Sprayer & Duster Association, at its fifth Annual Meeting held in Chicago the middle of June, reelected its former slate of officers and charted its program for the coming year. C. D. Leiter, sales manager, F. E. Myers & Bro. Company, Ashland, Ohio remains as president of the Association and chairman of the executive board. R. B. Chapin, president of the R. E. Chapin Mfg. Works, Inc. of Batavia, New York is vice president, D. P. Lewis, H. D. Hudson Mfg. Company Chicago, treasurer; and Earl D. Anderson and Frank J. Zink of Frank J. Zink Associates were again named Secretary and Counsel respectively. Reelected to the executive board in addition to the officers, were the following: P. L. Hauser, Sales Mgr., Lowell Mfg. Company, Chicago; H. F. Brandt,

President, Dobbins Mfg. Company, Elkhart, Indiana; R. C. Hudson, President, H. D. Hudson Mfg. Company, Chicago; and T. M. Burton, Vice President, D. B. Smith & Co., Inc., Utica, N. Y.

•

Shade Tree Conference

The annual meeting of the National Shade Tree Conference was all set to be held at Hotel Syracuse, Syracuse, N. Y. on August 21-25 as this issue went to press. As previously announced, the meeting was to consist of field demonstrations, educational sessions and instructions in proper spraying operations.

Dr. Curtis May, U.S.D.A., Beltsville, Md., was to talk on Elm and Oak tree diseases; Dr. Paul J. Kramer, Duke University on aeration; and Dr. J. C. Carter, Illinois Natural History Survey, on Cytospora canker.

Plant clinics were to be featured on the program, and manufacturers of various devices for tree care will exhibit their products. A day was to be given to field demonstrations of equipment, and educational demonstrations of safety in tree work. Representatives from New York State College of Forestry and Cornell University were to present educational exhibits.

•

Mente Appoints Salesmen

Mente & Co., Inc., New Orleans bag manufacturers, announce

CAMP BECKLEY

the appointment of two new sales representatives, Roy L. Beckley with headquarters in St. Louis, Mo.; and Thomas I. Camp who will handle sales in the Cincinnati area.

Mr. Beckley, well-known throughout the Middle West, joins Mente after 28 years with the Werthan Bag Corporation. He will handle sales in Eastern Missouri and Iowa and the southern portions of Illinois and Indiana. Mr. Camp, formerly with the Canadian Bag Company in Toronto for many years, will represent Mente in Ohio, Kentucky, West Virginia and western Pennsylvania.

•

New Name for Mfg. Co.

National Technical Laboratories, manufacturers of Beckman pH Meters, and other scientific and industrial instruments, has changed its corporate name to "Beckman Instruments, Inc." This action was taken for the purpose of associating the corporate name more closely with the trademark of the principal products.

No other changes are involved —either in company organization, policies, personnel, or products . . . or in the locations of its factory and service branches in New York, Chicago and South Pasadena, California.

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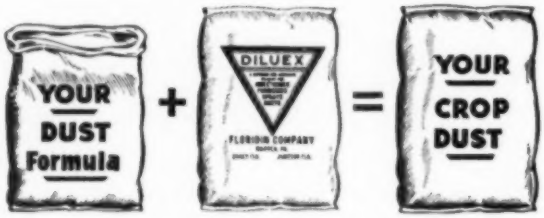

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Hercules Plans New Toxaphene Plant

Site of the new toxaphene plant, Hattiesburg, Mississippi.

HERCULES Powder Company has announced plans for the construction of a second unit for the manufacture of toxaphene, at Hattiesburg, Mississippi. The new plant is expected to increase the production of toxaphene by almost 50 per cent. The company's other plant at Brunswick, Georgia, has been in operation since 1947.

Construction was to begin immediately, according to A. E. Forster, general manager of the Hercules naval stores department. Production is expected to begin in February, in time for control of insects on 1951 crops.

"Hattiesburg was selected as the new production site to bring the product closer to the vast cotton-growing regions of the Mississippi Delta, Arkansas, Louisiana, and Texas," Mr. Forster explained. The Hercules naval stores plant will furnish power, steam, laboratories and supervisory personnel.

The new plant will be modern in all respects. The basic design, though similar to the Brunswick plant, will include many improvements developed by the Hercules' engineering department.

The company's naval stores department has extracted turpentine from Southern pine found in Georgia, Florida, and Mississippi for many years. Shortly after the beginning of World War II, it chlorinated camphene derived from turpentine, producing a material that showed promising insecticidal activity against a wide number of insects.

As a background for the manufacture of toxaphene, a pilot plant was erected in 1945 with an initial production sufficient to provide material for large-scale field tests. In 1947, a small commercial plant was started along with limited commercial use, and additional large-scale tests were continued throughout the year. The next year, production of the technical material was doubled and the story of enlarged facilities has been repeated each year since then.

Paralleling the increase in production of toxaphene as its market expanded has been the decrease in price. The original price of about 35 cents a pound in 1946 was reduced to 24 cents in 1948, and is currently 20 cents.

Toxaphene has been recommended by leading cotton-producing states for control of all major cotton insects including the boll weevil, boll-worm, cotton aphid, cotton fleahopper, southern green stinkbug, leafworm, and thrips. Another major use is in the control of grasshoppers and armyworms.

•

J. G. Sanders Retires

James G. Sanders has announced his retirement from Commercial Solvents Corp., New York, effective August 1. He stated that he would take a "long fishing vacation" before forming a new connection.

Dr. Sanders has had a long and distinguished career as a scientist with the USDA, in a number of State departments, and with industry during the past half century. Early in his career he became an authority on scale insects during his work with the USDA, then in 1910 went to the University of Wisconsin to organize its department of entomology. He was made state entomologist and later head of the experiment station department of entomology.

Later, he went to the State of Pennsylvania where he formed its bureau of plant industry, built up a half-dozen field stations, formulated the economic poison inspection laws for the state, was responsible for enforcement of regulations, and started the State Botanical office. While in Pennsylvania, he discovered the "Black Wart" disease of potatoes and was sent to Europe to bring back immune varieties which are still grown in parts of the area.

Further activities here and abroad included a study of Japanese Beetle, for control of which he had parasites imported from Japan, in addition to making investigations toward chemical control. He was one of the early developers of benzene hexachloride, and was responsible for the developement of the 3-5-40 cotton dust mixture.

Dr. Sanders was president of the American Association of Economic Entomologists in 1922.

During the late war, he was sent to South America and to Persia for the U. S. Government. He has been with Commercial Solvents Corp. for nearly five years.

•

Dakota Weed Control Leads

Some 2,990,000 acres of crop land in North Dakota were treated with 2,4-D weed killers in 1949, according to reports coming out of a recent statewide conference on the use of chemicals in agriculture. The North Dakota program was launched to increase yields of grain and other crops by eliminating competition of weedy growths.

Jap Beetle Control

In preliminary tests at Lebanon, Pa., in 1946 for the control of the adult Japanese beetle (Popillia japonica Newm., emulsions of TDE and DDT gave comparable results on hybrid corn when applied by airplane at the rate of 1 pound of toxicant per acre. In 1947 wettable powder sprays of TDE were inferior to those of DDT when applied with a mist blower to corn at Lebanon, but both insecticides gave equally good results when applied to peaches with an orchard sprayer at Shiloh, N. J.

In preliminary laboratory tests with TDE and DDT mixed with soil, TDE appeared to be slightly less toxic than DDT to third-instar larvae. TDE also appeared to be slightly less effective than DDT in controlling infestations of larvae in turf at Blairstown, N. J., and at Orange and New London, Conn., when applied as a dust to the surface.—U.S.D.A. Bulletin E-804, July, 1950.

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but give your customers one

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Customers will approve your use of Bemis Paper Bags . . . Bemis Flexi-Cartons (1- to 25-lb. sizes, 1- or 2-ply construction) for shelf-display packages and Bemis Multiwalls (25- to 100-lb. sizes, 3- to 6-ply construction) . . . because they're sturdy and non-sifting. They handle and store well. *That's good for your business.*

You will like the way they pack and close (fast and easily), and the way all sides display your brand. Both Flexi-Cartons and Multiwalls are adaptable to a wide variety of closures.

These Bemis Paper Bags are the most economical packages worthy of your good product . . . and *their economy is certainly good for your business.*

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Bemis BAG COMPANY

"America's No. 1 Bag Maker"

Henry, C.S.C. Vice Pres.

Harold J. Henry has been appointed vice president in charge of sales of Commercial Solvents Corporation, according to J. Albert

HAROLD J. HENRY

Woods, president. Mr. Henry was formerly president and general manager of Tek Hughes, Inc., a subsidiary of Johnson & Johnson of which he was also a Director. He will succeed Henry W. Denny who has retired.

•

Former V-C Official Dies

Spencer L. Carter, retired former president of Tobacco By-Products and Chemical Corporation and also a former vice-president of Virginia-Carolina Chemical Corporation, died July 3, 1950, at Richmond, Virginia.

Mr. Carter, a native of Virginia, served as president of Tobacco By-Products and Chemical Corporation from 1920 to 1945. He became associated with V-C in 1897 and was vice-president from 1919 to 1932, when he was made first vice-president in charge of operations. He served in that position until 1935 and was a member of the V-C Board of Directors for 15 years. He retired December 31, 1945. His activities in the field made him widely known in the agricultural chemicals industry.

•

Warner to Int. Min. Board

Rawleigh Warner, chairman of the board of Pure Oil Company, was recently elected a member of the Board of Directors of International Minerals & Chemical Corp.

A & S Appoints Noble

Arkell & Smiths, paper bag manufacturers, has announced the appointment of W. E. Noble as assistant to Howard C. Peterson, Jr.,

W. E. NOBLE

General Sales Manager. Mr. Noble studied Business Administration at New York University and was formerly associated with The Borden Company. His headquarters are at Canajoharie, N. Y. where he will coordinate the customer service and market development work of the A & S sales department.

■

V-C Advances Two

Virginia-Carolina Chemical Corporation, Richmond, Va., has announced the appointments of Preston L. Parrish and D. M. Low as assistant managers of its purchasing department. Mr. Parrish has been a member of the V-C Corporation for 26 years and is widely known in the industry. Mr. Low, also a member of the firm for many years, will supervise the purchase of factory supplies.

●

Expands TCA Production

Dow Chemical Co., Midland, Mich., has announced the stepped-up production of "Sodium TCA 90%", sodium trichloroacetate product for control of perennial and annual grass. The compound, first introduced in 1949, has created a demand large enough to warrant the expansion program.

New Defoliant Announced

Shell Chemical Corp., New York, has introduced a new soybean defoliant, sold under the trade name of "Early Frost". The compound, described as a blend of petroleum hydrocarbons fortified with pentachlorophenol, has undergone rather extensive tests in the midwest, with satisfactory results, according to the makers.

It is pointed out that the combining of soybeans is often difficult because of interference of weeds and grasses, but if a grower delays until late in the fall or winter to minimize the weed problem, losses in yield frequently occur.

Results of experiments in 1949 are described in a company report, as follows: In September 1949, 550 acres of soybeans on Valley Farms and neighboring farms near Carrollton, Illinois, were sprayed with Shell "Early Frost" at rates of 2, 4 and 6 gallons per acre. The results obtained after four days were similar. In all cases soybeans which

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TYPICAL CHARACTERISTICS OF MONET-O-X

Fineness	99% through 325 mesh
Density (Vibrated)	26.7 pounds per cubic foot
PH Value	Below 7.0
Inert	Compatible with insecticide and fungicide poisons
Suspension	Excellent in both air a d water

Sulphur Grinders

MONET-O-X Grinders Inert. Increase grinding production, and conditioning of Sulphur. The most economical Inert on the market.

Samples on Request

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MINES AND PLANT MONETTA, S. C.

had begun to drop their leaves were dried until the moisture content was under 14 %. The grasses too were dried to a point where they were no longer a problem in combining. The weeds, which consisted mostly of cockleburs, ragweed, pigweed, horseweed, bindweed, corn cockle and shoestring, ere so dried and brittle that the stems went through combines without slowing up the operations in an appreciable way. Spraying was conducted only on fields where weeds which would delay normal harvesting were present and the results were uniformly good even though the spraying was conducted at all times of the day and when ground winds were stronger than those customarily considered practical for normal spraying operations.

Bean fields sprayed on September 2 were combined on September 8, 9 and 10. One weedy field sprayed on September 19 was combined on September 21 and 22.

The company recommends that application should be made with the product undiluted at the rate of 2 gallons per acre, using either an airplane or ground spraying equipment. If unusually heavy concentration of weeds is encountered, from 4 to 6 gallons per acre may be required. Additional information is available from the Shell Chemical Corp., 50 West 50th St., New York 20, N. Y.

PYRAX ABB is the most widely used Pyrophyllite in the agricultural field as a carrier for insecticides and fungicides.

CHEMICALLY INERT—pH BETWEEN 6.5 AND 7.0— The toxic strength of rotenone, pyrethrum, fixed coppers and the newer organic toxicants for agricultural dusts are unaffected by **PYRAX ABB,** *even when stored from season to season.* These characteristics have permitted satisfactory insect control with the use of *less toxicant,* thus minimizing the residue problem.

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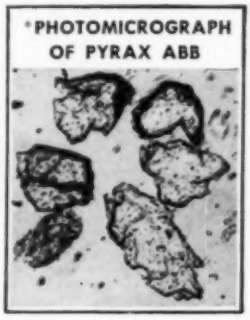

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SPECIALTIES DEPARTMENT
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INSECT SITUATION

(*Continued from Page 47*)

Mississippi. The situation created by it rapid early spread made this pest a much greater threat to the cotton growers than during any recent year. Heavy infestations were spotted and limited except in the Gulf Coast and southerncounties of Texas where control measures were being applied in many of the heavily infested fields.

The tobacco budworm was troublesome in many cotton growing areas of Alabama, Louisana, Arkansas, Mississippi, Georgia, and South Carolina during late June and early July. The boolworm also caused some trouble in these and other states.

Fruit Insects

CODLING moth infestations remained generally light in well sprayed orchards in all fruit growing areas from which reports were received. European red mite infestations appeared to be increasing during late June and early July in many orchard areas, including New Jersey, Delaware, South Carolina, Ahio, southern Indiana, southern Illinois, and Missouri. Infestations of the red-banded leafroller have been light in all areas reporting.

Truck Crop Insects

INFESTIONS of the Mexican bean beetle continued moderate to heavy during the last half of June and the first half of July in Atlantic Coast and Gulf districts extending from New York to Mississippi, and in Tennessee. Lighter infestations prevailed in Ohio, New Mexico, Colorado, Nebraska, and Wyoming.

Cabbage caterpillars were abundant in many Atlantic Coast areas from New York to Florida and in parts of Mississippi, Tennessee, Ohio, and Utah.

Light to moderate numbers of the pea aphid were reported during late June and early July on peas in Maine, New York, Ohio, Wisconsin, southern Idaho, Utah, and the Blue Mountain district of Oregon-Washington. Pea weevil infestations were serious and required treatment in New York and northern Utah. Light populations of that insect were reported from Idaho, Washington, and Oregon.

Aphids were present in destructive numbers on tomato in New York and Ohio and on peppers in California during the last half of June, and moderate numbers of the potato aphid were reported attacking tomato in parts of New York and Maryland toward the middle of July. Infestations of the potato aphid have been increasing since mid-June on potatoes in Maine.

By early July aphid populations on tobacco had diminished to relatively light numbers in Georgia and Florida, but infestations were on the increase in Tennessee By July 15 they were reported as more numerous on tobacco in the latter state than ever before.

TECHNICAL BRIEFS

(*Continued from Page 54*)

Almost daily spraying for 2 weeks appeared to be necessary to reduce the fly population, but thereafter two or three applications a week maintained a high degree of control.

Laboratory tests with flies from most of the dairy barns showed that all were resistant to DDT. The exposure time required to kill 70 percent of the female flies from dairy barns was 10 times that for the laboratory colony. With methoxchlor the exposures of dairy flies were 2 to 3 times, and with toxaphene, lindane, and dieldrin less than twice as long as for the laboratory colony. There appeared to be no particular correlation between degree of resistance to DDT and the degree of control obtained with other insecticides.—From U.S.D.A. Bulletin.

BULLETINS

(*Continued from Page 55*)

the protection of foodstuffs.

A unique factor in the carrier used with "Pyrenone Wheat Protectant," is that the carrier consists of wheat itself. The material is pulverized to a controlled fineness of 150 mesh. In using the "Pyrenone Grain Protectant," where an organic carrier is not required, special grades of fibrous talc or mineral are used.

Laboratory and field tests of the new products have been under way for four years, the company states. More than a hundred demonstrations have been completed, ranging in quantities from two bushels to 16,000 bushels. Protection against infestation for as long as 9½ months have been indicated, and in some cases the materials have eliminated extraordinarily heavy infestations.

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MOLYBDENUM

(*Continued from Page 32*)

no combined nitrogen was supplied. In the third cutting, two cultures from each triplicate series were treated with sodium nitrate.

Plants grown on soils with a pH value of 4.3 made very little growth with or without molybdenum, but plants grown at pH 5.5 produced highly significant yield increases from molybdenum treatment. Responses to molybdenum at higher pH values were less pronounced. Leaves or alfalfa grown at pH 5.5 with molybdenum developed severe chlorosis, but molybdenum-treated plants grown at this reaction appeared dark green and vigorous. Analyses showed that molybdenum-treated alfalfa contained from 31 to 34 per cent more total nitrogen than that not so treated. Molybdenum-deficient alfalfa grown at pH 5.5 contained less than 0.05 ppm. of the element, but plants grown at pH values above 5.5 absorbed increasing amounts of molybdenum as the soil pH was raised. Since the deficiency symptoms could be prevented by treating soils with either molybdenum or nitrogen compounds, it was concluded that molybdenum benefitted the alfalfa by increasing nitrogen fixation.

Field experiments were conducted in northern New Jersey to determine whether or not certain soils in the area supplied adequate molybdenum for maximum yield of high quality hay. Four plots were laid out on established alfalfa stands at eight locations, and two plots in each field were treated with sodium molybdate at the rate of 1 pound per acre. Results of the 1949 harvests from each field showed that molybdenum applications increase yields on the average by 12 per cent and the nitrogen content by 4 per cent. Responses were obtained in most fields where the untreated alfalfa contained 0.5 ppm. molybdenum or less, but in some fields responses were obtained when the molybdenum content of untreated plants was as high as 2.1 ppm. There was some evidence to show that high manganese in plant tissues increased the molybdenum requirement.

In other field experiments, the effect of different rates of application of molybdate on the molybdenum uptake by alfalfa was studied. This in-

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vestigation was required since plants containing excessive molybdenum are toxic to cattle. Results of this experiment showed a close correlation between the amount of molybdenum applied to plots and the content of the element in the hay produced. It was concluded that not more than one-half pound of molybdenum trioxide per acre should be applied to soils with a pH value of six or below. Treatments for soils with pH values higher than six should not exceed one-fourth pound MoO_3 per acre.

The evidence indicates that molybdenum must be seriously considered as a nutrient element for yield crops. Since only very small quantities are required, it seemed desirable to determine the quantities of molybdenum supplied to soils as impurities in fertilizers and liming materials. The work of Robinson showed that phosphate rock from certain sources contained in excess of 200 ppm. total molybdenum whereas other samples contained as little as 1 ppm. Comparable data for liming materials and nitrogen and potash salts did not exist. Through the courtesy of producers, 26 samples of nitrogen and potash salts and five samples of liming materials were obtained. Analyses showed that most samples contained between 0.05 and 0.2 ppm. water-soluble molybdenum and between 0.05 and 3.8 ppm. total. At least one-half the molybdenum in most fertilizer materials was soluable in water. Total molybdenum in liming materials ranged between 1.6 and 3.8 ppm., but none of this was water soluble. On the basis of the work of Anderson, it was concluded that the soluble molybdenum in a normal application of lime or of potash or nitrogen fertilizers would not meet the requirements of legumes. More work is needed to determine the value of the insoluble molybdenum in liming and fertilizer materials.

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SEED TREATMENT

(*Continued from Page 30*)

Micronized sulfur has been used at times for controlling bunt in wheat and kernel smuts in sorghum. It is cheap and abundant but is not highly recommended because of its failure as a seed protectant.

The use of various gases, vapors, diathermy, ultraviolet and infrared rays, and other devices, have occasionally been advocated for seed treatment, but their feasibility has not been demonstrated sufficiently to warrant their recommendation.

(Part II next month.)

•

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Innis, Speiden & Co., New York, has introduced a new soil fumigant for both greenhouse and outside use. Called "MLD", the material is said to be particularly effective in killing most nematodes; weed control is good when the fumigant is properly used and under conditions of moderate infestation, soil-borne diseases are controlled.

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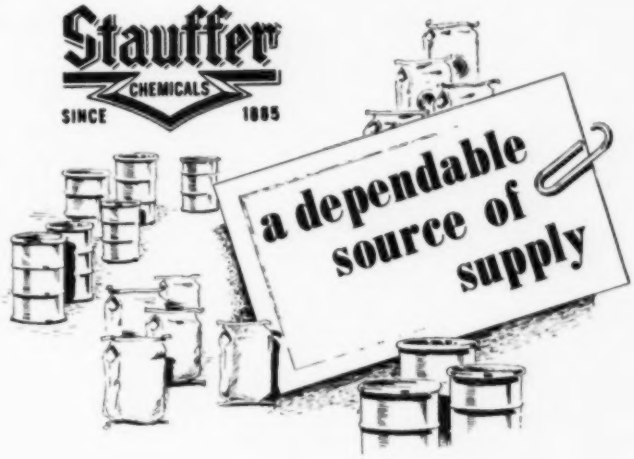

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experimental fumigant. It cannot be used in the presence of living plants.

FERTILIZER TOUR

(*Continued from Page 35*)

cluded J. W. Atwood, Rhode Island; J. S. Owens, Connecticut; R. W. Donaldson, Massachusetts; L. H. Smith, Vermont; R. B. Littlefield, New Hampshire; R. F. Talbot, Maine; and Robert H. Engle, the National Fertilizer Association, Washington, D. C., co-chairman.

Since 1950 has been proclaimed officially as being "Green Pastures Year" by the six governors of the New England states, this year's tour was given added significance. The pastures which were inspected presented graphic evidence of the value of fertilization, but beyond that, and more important than the lush appearance of the growth, is the fact that the application of fertilizer on pasture lands pays the farmer real dividends, according to Dr. M. H. McVickar, chief agronomist of the NFA.

"These tours are very helpful in getting the idea of pasture fertilization across to the rural areas," Dr. McVickar stated, following the New England trip. "It is largely a matter of education, but this type of teaching is especially convincing since it shows the farmer not only what can be done, but what is *being* done by others in his own community," he said. "It is a worthy idea and it is going over . . . but it still requires a lot of hammering to put it across 100 per cent," he concluded.

ALLETHRIN TESTS

(*Continued from Page 24*)

the synthetic material to a number of pests (Table 2).

C. F. Rainwater, Wm. Iglinsky, and A. L. Scales conducted a few laboratory tests of the synthetic and natural materials with and without piperonyl butoxide against the red spider, the cotton leafworm, and the cotton aphid. Against the red spider a dust consisting of 0.1% of active ingredient in Attaclay was applied to infested seedling cotton plants at the rate of 10 pounds per acre. The kill after 60 hours was 19.7% for the synthetic and 4.6% for the natural material. The addition of the synergist failed to increase the kill.

When applied against the cotton leafworm as 1% and 2% dusts at 10 pounds per acre, the synthetic material showed 5 to 15% kill while the natural pyrethrins at 0.5% gave a 25% kill.

In tests against the cotton aphid, 1% and 2% of the synthetic material were used in error while the natural material was used at 0.1 and 0.2% strengths. The net mortality was about the same, 10 to 14%, for the two materials, thus indicating that the natural was more toxic. Even at 10% the synthetic pyrethrins killed only 53.3%.

A few preliminary tests of these materials were carried out by D. D. Questel on newly hatched larvae of the European corn borer.

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The synthetic ester at 1/32 pound to 100 gallons of water gave 100% kill and at 1/128 pound gave a kill of 33.7%. In comparison, natural pyrethrins in the form of pyrethrum flowers powdered and suspended in water at 1/100 pound per 100 gallons gave a kill of 100% and 1/200 pound per 100 gallons a kill of 23%. The natural product was thus about three times as toxic to young corn borers as the synthetic material. In these tests, the toxicity of the synthetic material to newly hatched larvae increased as much as eight fold with the addition of various synergists.

Summary

MANY years of work by chemists in this Bureau resulted in the discovery of synthetic pyrethrin-like esters. Biological tests with one of these esters showed it to be superior to the natural pyrethrins in insecticidal value. The full significance of this discovery has not yet been ascertained, but it may have a considerable impact upon the pyrethrum industry. Much interest has been shown in synthetic pyrethrin-like esters since they do not present the toxic hazards associated with many of the new chlorinated hydrocarbon and organic phosphorus insecticides.

Preliminary results of tests made by members of the Bureau of Entomology and Plant Quarantine against various insect pests indicate that a synthetic material, the allyl homolog of cinerin I, was superior to natural pyrethrins against several species, about as toxic to many others, and decidedly inferior against certain pests of field crops. In some instances the synthetic product was less effective than the natural pyrethrins at low concentrations whereas the reverse was true at high concentrations. Wide differences in toxicity to insects also resulted when different synergists were added to the sprays. Marked differences in toxicity were shown between dusts and sprays containing these materials. The synthetic product and the natural pyrethrins in aerosols were about equally toxic to house flies and mosquitoes whereas the natural pyrethrins were several times more toxic to cockroaches. The preliminary nature of the tests reported is emphasized.

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Industry Patents

2,505,059. 2,4-D Salt and Composition Containing the Same. Patent issued April 25, to Ralph G. D. Moore, Phillipsburg, N. J., assignor to J. T. Baker Chemical Co., Phillipsburg. The morpholine salt of 2-4-dichlorophenoxy-acetic acid.

2,505,698. Insecticidal Compositions Containing Pyrethrin and Rotenone Extracts. Patent issued April 25, to Herman Wachs, Brooklyn, and Kurt Kulka, New York, N. Y., assignors to U. S. Industrial Chemicals, Inc., New York. A concentrated insecticide composition comprising at least one insecticide selected from the class consisting of pyrethrin and rotenone in the form of an extract containing resinous material dissolved in a liquid solvent having the following formula:

R—O—CH_2—CH_2—O—T

where R is an alkyl substituted and otherwise unsubstituted phenyl group having from 3 to 8 alkyl carbons and T is selected from the group which consists of CH_2—CH Cl, CH_2—CH_2—OH and CH=CH_2, said liquid solvent being miscible with petroleum solvents and dichlorodifluoromethane, whereby the concentrated composition including the resinous material of the insecticide may be put into solution in such solvent-diluents.

2,505,699. Insecticidal Compositions Containing Pyrethrum Extracts and Piperonyl Cyclohexenones. Patent issued April 25, to Herman Wachs, Brooklyn, and Kurt Kulka, New York, N. Y., assignors to U. S. Industrial Chemicals, Inc., New York. A concentrated insecticide composition comprising pyrethrum extract containing resinous material, a piperonyl cyclohexenone synergist, and a liquid solvent for the pyrethrum extract, including the resinous material thereof, and the synergist having the following formula:

R—O—CH_2—CH_2—O—T

where R is an alkyl substituted and otherwise unsubstituted phenyl group having from 3 to 8 alkyl carbons and T is selected from the group which consists of

—CH_2—CH_2Cl, —CH_2—CH_2—OH

and —CH=CH_2, said liquid solvent being miscible with petroleum solvents and dichlorodifluoromethane, in which resinous portions of the pyrethrum extract and the synergist are not more than slightly soluble, whereby the concentrated composition, including the resinous material of the extract, and the synergist readily may be put into solution in such solvent-diluents.

2,514,725. Dirigible Spraying Device for use in Sprayers of the Articulated Boom Type. Patent issued July 11, to E. D. Schlaphoff and E. C. Schlaphoff, Waverly, Nebr. A jointed spraying boom comprising at least two sections hinged together on a transverse axis so as to be moveable angularly one relatively to another; spray nozzles mounted at intervals along the length of each of said sections; a dirigible nozzle mounted to swing about an axis substantially coincident with the axis of said hinge; mechanism actuated by the relative angular motion of the boom section and connected to swing said nozzle at an angular rate which is substantially half said relative angular motion; and connections for supplying to all said nozzles liquid to be sprayed.

2,515,198. Herbicides. Patent issued July 18, 1950, to R. C. Rosser and Amherst E. Colby, Midland, Mich., assignors to Dow Chemical Co. An herbicide concentrate comprising an alkanolamine salt of a chlorophenoxy-acetic acid and a water-soluble methyl cellulose in the amount of at least 0.01 per cent by weight of the amine salt present in the concentrate.

2,515,792. Spraying Machine. Patent issued July 18, to F. W. Ofeldt, Carnot, Pa., assignor to Homestead Valve Mfg. Co., Coraopolis, Pa. The method of producing and distributing a spray substance which consists in the steps of metering under pressure a predetermined quantity of highly concentrated spraying substance into a stream of vapor under pressure, atomizing the spraying substance by discharging it with the vapor under pressure, regulating the size of atomization of the spraying substance by controlling its metered supply and the pressure of the vapor, generating an air blast by the vapor pressure for blowing the atomized spraying substance to distribute it over the area to be treated and regulating the vapor pressure to change the velocity of the air blast to control the distribution of the atomized spraying substance.

Trade Mark Applications

Brasco, in hand-lettered capitals within diamond-shaped frame, for insecticides and rodenticides. Filed Oct. 27, 1848, by R. A. Bradford, Jr., doing business as Bradford Mfg. Co., Jackson, Tenn. Claims use since Apr. 7, 1948.

Manco, in caps and lower case, for zinc sulphate and zinc chloride. Filed Sept. 29, 1948, by Maneely Chemical Co., Philadelphia. Claims use since Sept. 9, 1948.

Neotran, in capital letters, for parasiticides, useful principally as an acaricide. Filed Dec. 13, 1948, by Dow Chemical Co., Midland, Mich. Claims use since Feb. 10, 1948.

Dimite, in caps and lower case letters, for insecticide and miticide. Filed June 9, 1949, by Sherwin-Williams Co., Cleveland, Ohio. Claims use since Feb. 11, 1948.

Halodane, in caps and lower case letters, for insecticide. Filed June 9, 1949, by Sherwin-Williams Co., Cleveland, Ohio. Claims use since Mar. 12, 1948.

Toxatone, in caps and lower case letters, for insecticides and pesticides. Filed June 9, 1949, by Sherwin-Williams Co., Cleveland, Ohio. Claims use since Mar. 4, 1948.

Zok, in hand-lettered outline capitals in irregular arrangement, for insecticides. Filed Aug. 9, 1949, by John C. Janoski, doing business as The Catex Chemical Sales Co., Philadelphia. Claims use since Apr. 23, 1949.

R.D.S. 1410, in bold face, for insecticide in liquid form. Filed June 17, 1949, by John Sexton & Co., Chicago. Claims use since Mar. 8, 1949.

Kare, in hand-lettered script, for insecticides. Filed July 20, 1949, by Windsor Wax Co., Inc., Hoboken, N. J. Claims use since Jan. 13, 1947.

Pentadine, in hand-lettered capitals, for chemical preparations useful for the preservation of wood. Filed Sept. 10, 1949, by American Chemical Paint Co., Ambler, Pa. Claims use since Aug. 19, 1949.

Mit-E-Kil, in capital letters, for insecticide. Filed Jan. 24, 1947, by Hinton & Co., Inc., New York. Claims use since August, 1941.

Gearphos, in outline capital letters, for agricultural insecticide. Filed Oct. 3, 1949, by Geary Chemical Corp., New York. Claims use since Sept. 22, 1949.

Worthmore, in Cooper upper case, for chemical weed killer, of which the active ingredient is 2,4-D or a derivative thereof, in powder or liquid form. Filed May 19, 1948, by Mutual Dealers Wholesale, Inc., St. Paul, Minn. Claims use since Mar. 1, 1948.

Cunilate, in thin capital letters, for fungicidal material. Filed Jan. 22, 1948, by Scientific Oil Compounding Co., Inc., Chicago. Claims use since Jan. 5, 1948.

Phos Kil, in script letters, for insecticides. Filed Nov. 23, 1948, by Food Machinery & Chemical Corp., San Jose, Calif. Claims use since July 28, 1948.

6-12 (Six-Twelve), white numerals within black circle, for insect repellent. Filed Jan. 24, 1949, by Carbide & Carbon Chemicals Corp., New York. Claims use since July 7, 1948.

Mag-70, in capital letters, for concentrated sulphur paste for use as an insecticide and agricultural fungicide. Filed June 17, 1949, by Stauffer Chemical Co., San Francisco, Calif. Claims use since Mar. 13, 1940, for the number "70," and since April 21, 1949, for entire trade mark.

Botonone, in outline caps and small caps, for insecticides and plant fungicides. Filed July 12, 1949, by J. de Sola Mendes, doing business as Industrial Aromatic Co., New York. Claims use since June 15, 1949.

Classified Advertising

Rates for classified advertisements are ten cents per word, $2.00 minimum, except those of individuals seeking employment, where the rate is five cents per word, $1.00 minimum. Address all replies to Classified Advertisements with Box Number, care of AGRICULTURAL CHEMICALS, 234 W. 31st St., New York 1. Closing date: 25th of preceding month.

Positions Wanted:

Responsible Position with a progressive insecticide concern in an administrative capacity desired by aggressive young man. Ten years experience including research, control, cost accounting, blending, grinding, diluents, field work and direct selling. Two years of college including Chemistry, Biology and Entomology. Address Box No. 454, care of Agricultural Chemicals.

Representative: Four years experience selling agricultural chemicals. Young, aggressive. Desires position agricultural chemicals or bag company in Intermountain or Pacific Coast area. Address Box No. 455, care of Agricultural Chemicals.

Sales Representation: Do you want to sell the chemical, chemical specialty, agricultural chemical, soap, detergent, and allied industries in New York Metropolitan territory? Man with 15 years sales experience this area knows the buyers, best references, good sales record, available for new connection. Could do excellent job for out-of-town manufacturer in N. Y. territory where experience and contacts would be valuable. For further details write Box No. 456, care of Agricultural Chemicals.

Masters Degree. Strong background in agricultural chemistry and related sciences. Desire position with a future. References, Address Box No. 457, care of Agricultural Chemicals.

Agricultural Chemist-Agronomist. Research and production in fine chemicals, insecticides and fungicides, teaching experience. Now employed. 20 credits toward Master's degree. Desire position with progressive organization. Location immaterial. Address Box No. 458, care of Agricultural Chemicals.

Fertilizer Salesman for recent agronomy graduate. Have had summer experience on farms. Also interested in other work closely related to the field of agronomy. Address Box No. 459, care of Agricultural Chemicals.

Agriculture graduate: Recent graduate from Cornell in agriculture desires position with agricultural chemical firm. Willing to start at bottom. Looking for opportunity which is more important than immediate salary. Prefer eastern states location. Box No. 460 care of Agricultural Chemicals.

Positions Open:

Field Representative: Agricultural chemical sales for large reputable manufacturer of basic insecticides. Degree in entomology, biology or equivalent experimental station or other experience required. Midwest territory. Address Box No. 452, care of Agricultural Chemicals.

Nationally Known U. S. Chemical Firm seeks man experienced in sugar cane to handle sales development work in Cuba on herbicides. Preferably some background agronomy or chemistry plus first hand field experience. Willing to locate extended period in Cuba. Fluent Spanish and some selling experience desirable. Work would involve contacting plantation supervisors, conducting field trials on weed control and training and trouble shooting on field application methods. Please submit qualifications, date available and salary expectation. Address Box No. 453, care of Agricultural Chemicals.

For Sale:

Our Fertilizer Plant in Augusta, Ga., now operating is for sale, 10,000 tons capacity. Mark J. Bridges, Mgr., Augusta Fertilizer Works, Augusta, Georgia.

Miscellaneous:

Spare Copy Wanted: Anyone having a spare copy of the January 1949 issue of Agricultural Chemicals, please contact Geigy Argentina, Av. Carabobo, Buenos Aires, Argentina.

•

Pest Control Meeting

The National Pest Control Association will hold its annual meeting at the Netherland-Plaza Hotel, Cincinnati, Ohio, on October 22, 23, 24, & 25, it has been announced by William Buettner, Brooklyn, N. Y., excutive secretary of the group. No program plans have been announced as yet.

Theodore Riedeburg Associates
Sales Consultants
and
Manufacturers' Representatives
on
Agricultural Chemicals
230 PARK AVE. NEW YORK 17, N. Y.
MUrray Hill 9-0060

ALVIN J. COX, Ph.D.
Chemical Engineer and Chemist
(Formerly Director of Science, Government of the Philippine Islands. Retired Chief, Bureau of Chemistry, State of California, Department of Agriculture.)
ADVISER ON AGRICULTURAL CHEMICAL PROBLEMS AND INVESTIGATIONS
Consultant in reference to spray injury and damage, claims, including imports of fruits and nuts, formulas, labeling, advertising and compliance with law.
1118 Emerson Street
Palo Alto, California

FLORIDA FIELDTRIALS
Testing agricultural chemicals in the field during the winter months.
DR. G. R. TOWNSEND
P. O. Box 356
Belle Glade, Florida

Two Fertilizer Meets

Fertilizer conferences were scheduled for the month of August at Princeton, Kentucky and State College, Pennsylvania. The first event, at State College, was slated for August 7 & 8, when the Pennsylvania Fertilizer Conference would convene. August 9 was to see the meeting of representatives of the fertilizer industry at the Western Kentucky Experiment Substation, Princeton.

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Fla. Tops in Phosphate

Production of 6,815,989 tons of phosphate rock in Florida was tops in the U. S. in 1949, the U. S. Bureau of Mines reports. The output was valued at $37,857,983.

Compares Sprays and Dusts

Oklahoma Agricultural Experiment Station, Stillwater, has issued mimeographed Circular M-200, "A Comparison of Sprays and Dusts for Control of Cotton Insects", prepared by F. A. Fenton of the department of entomology. The bulletin states that the effectiveness of control in spraying depends upon the amount of toxicant used per acre rather than the number of gallons of spray applied per acre. In dusting operations, it was found that two dust formulations were equally effective when applied at from 10 to 15 lbs. per acre for a total of five appplications. Formulations used were the so-called "3-5-40" (3% gamma isomer of BHC; 5% DDT; and 40% sulfur) and another containing 20% toxaphene and 40% sulfur.

•

New Insecticides and Bees

Contrary to the opinions of some, no bee colonies have been lost because of use of DDT, DDD, toxaphene and other modern insecticides, according to E. Eckert, bee specialist of the College of Agriculture, Davis, California. In this, as in many other respects, there seems to be a big improvement over the arsenicals, which are stomach poisons and are carried into the hive by bees. It does not mean, however, that the new chemicals, which are contact insecticides, will not kill individual bees when coming in contact with them.

Since the introduction and a wide use of DDT in 1948 in California, losses from poisoning of insects has been cut to such an extent that the beekeeping industry has been able to survive and provide pollination necessary for the successful production of most fruit, vegetables and seed crops of that state.

By using the lowest necessary amounts when relatively few pollinating insects are flying, losses of bees can be reduced still further.

—A. E. Murneek in *Missouri Horticultural News*, May, 1950.

•

Ampion President Dies

Leonard B. Schwarcz, president of Ampion Corp., New York, died June 29.

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(The Advertisers' Index has been checked carefully but no responsibility can be assumed for any omission)

Ease the Road...

A SALESMAN'S road can be pretty steep and bumpy at times. And nothing can make it rougher for your salesmen than to call on prospects unheralded and unknown. The unknown salesman of unknown products has two strikes on him before he goes to bat. But, if, through advance advertising, for example, the buyer knows something about your products and your firm, the sales road is bound to be easier, smoother.

If you would ease the road for your salesmen in the field of chemicals for agricultural use—and help to keep it smooth for more effective selling,—we suggest that you advertise regularly in

AGRICULTURAL CHEMICALS

254 WEST 31st STREET NEW YORK 1, N. Y.

TALE ENDS

One of the hazards of "reporting" distant meetings which are held near magazine closing time, is illustrated in the fact that the actual program of the Pacific Slope Branch of the American Association of Economic Entomologists (Santa Cruz, Calif., June 14-16) was somewhat altered from the report published in our July issue. Dr. Stanley F. Bailey, University of California, Davis, writes that six of the scheduled papers were not presented, and that three new ones were added. The additional papers included presentations by Carl E. Rodegerts, R. G. Rosensteil and William Besler.

As a grand finale, Dr. Bailey notes, a convention of *coroners* followed the meeting of entomologists at the Casa del Rey hotel. Not that the coroners had any work to do there, it is added hastily.

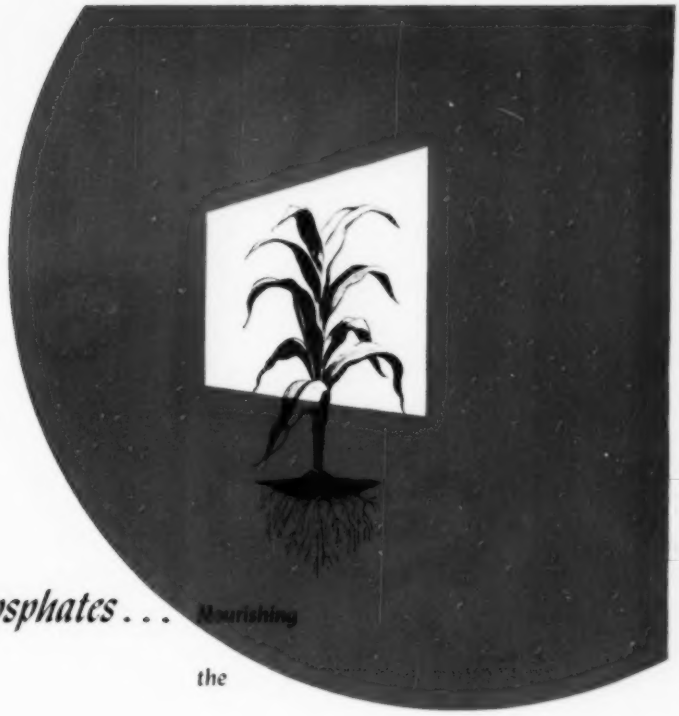
•

Phosphate deposits in Maryland? Yes, there are, according to newspaper stories telling about the discovery of a bed of the mineral on the farm of O. J. Shinham, a resident of Dargan, (Washington County), Md. Noticing that trees and underbrush grew at a phenominal rate on part of his farm, he had chemical tests made which revealed a percentage of tricalcium phosphate which seemed "next to impossible."

Farmer Shinham tried out several truck loads of the material on other parts of his farm, and found it highly successful as a plant food. Geologists estimate that perhaps a half-million tons of the material in the vein 100 ft. in width, nearly 250 ft. deep and about 800 feet long. Tests of phosphate from various parts of the bed show a consistent 65 percent bone phosphate of lime, 30 percent of which is phosphoric acid.

•

Did you read where one of the largest fertilizer plants in N. Korea tangled with a few American bombs?



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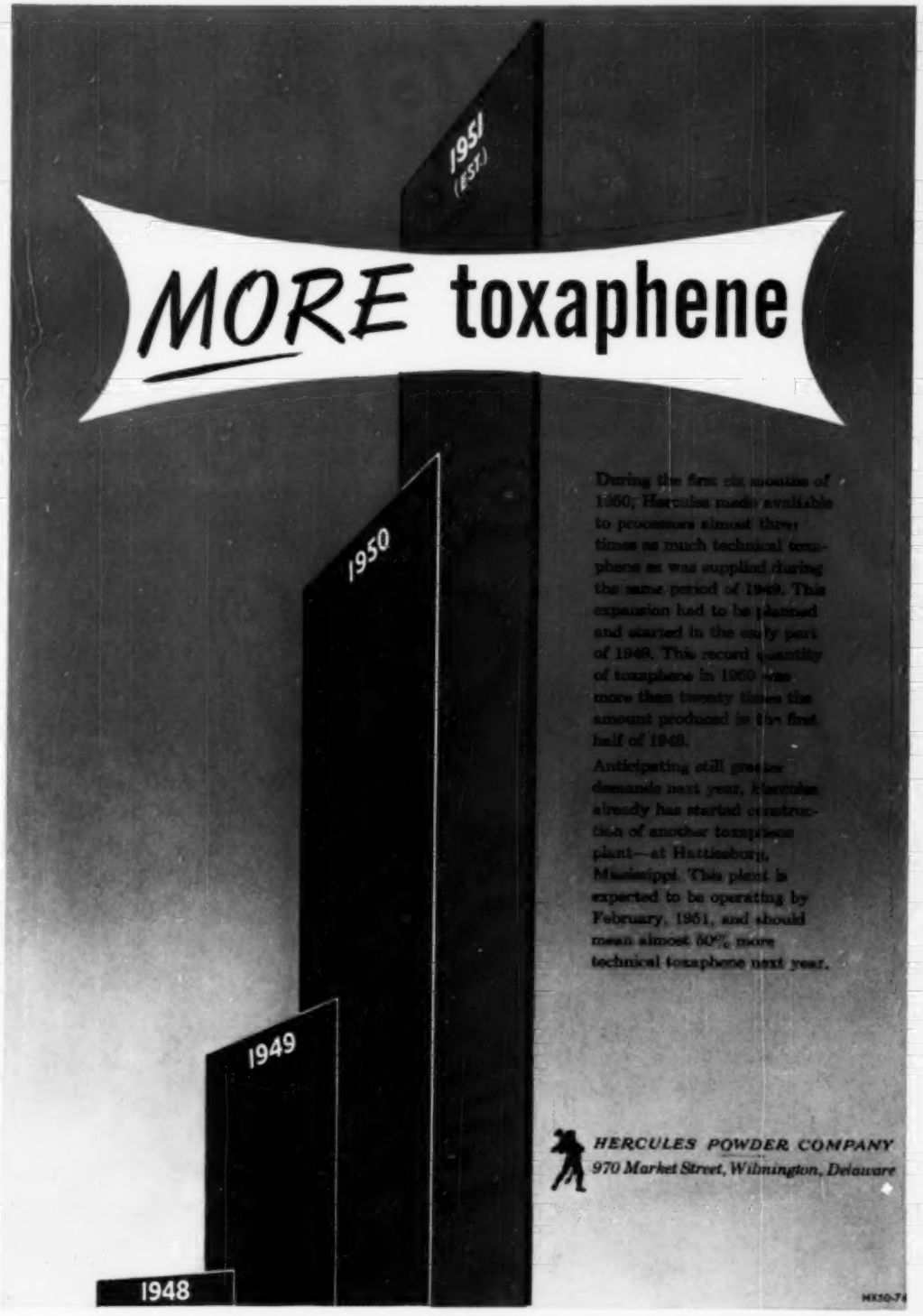
INTERNATIONAL MINERALS & CHEMICAL CORPORATION

PHOSPHATE DIVISION

General Offices: 20 North Wacker Drive, Chicago 6

Mines and Plants in Florida at Noralyn, Peace Valley, Achan, Mulberry, in Tennessee at Mt. Pleasant and Wales


1951
(EST.)
MORE toxaphene
1950
1949
1948
During the first six months of 1950, Hercules made available to processors almost three times as much technical toxaphene as was supplied during the same period of 1949. This expansion had to be planned and started in the early part of 1949. This record quantity of toxaphene in 1950 was more than twenty times the amount produced in the first half of 1948.
Anticipating still greater demands next year, Hercules already has started construction of another toxaphene plant—at Hattiesburg, Mississippi. This plant is expected to be operating by February, 1951, and should mean almost 50% more technical toxaphene next year.
HERCULES POWDER COMPANY
970 Market Street, Wilmington, Delaware
MX50-7